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INCOSE

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INSIGHT

Highlights from the 1998 International Workshop

INCOSE
INSIGHT
A PUBLICATION OF THE INTERNATIONAL COUNCIL OF SYSTEMS ENGINEERING

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Contributing Editors: Donna Rhodes, Lori Pajarek, Randy Case

Who are we? INCOSE is a 3000+ member organization of systems engineers and others interested in systems engineering. Its purpose is to foster the definition, understanding, and practice of world class systems engineering in industry, government, and academia. INCOSE is comprised of chapters located in cities worldwide and is sponsored by a corporate advisory board and led by elected officers, Regional Directors, and Directors-at-Large.

From the Editor

The Theme and Team Approach ...or, Is it a Newsletter or a Magazine?

WELCOME BACK! It's good see to you, our readers, face to paper again. I'm sure you've noticed that your mailbox has not yielded the last two issues of ***INSIGHT***. I'm here to tell you that this will not happen again. Rather than belabor the point, I would like to introduce myself and describe our new look and format.

First, I'll introduce myself. I am INCOSE member #142, a systems engineer at Lockheed Martin Federal Systems in Owego, New York, and editor of this publication from mid 1994 to mid 1996. After a brief visit to the Editor's Retirement Home, my insanity returned and I decided to return to the Communications Committee, and focus my energy on revitalizing and upgrading ***INSIGHT***.

As you know, upgrading is no easy job. As systems engineers and consumers, we've experienced tough decisions and emotions when developing or buying product upgrades. ***INSIGHT*** has been through several upgrades in order to meet the needs of this organization. Many of the changes have been driven by this publication's customers—INCOSE's leadership and membership. As an example, for several years Past President Eric Honour has been pestering the Communications Committee to dress up ***INSIGHT*** in a new format. "I want color," he hollered. "All the other organizations have magazines with color!" Current President Bill Schoening, wanted more technical content because, "that's why people join INCOSE. They want to learn and they want usable products. Let's give our members more for their money!" So, we took the inputs of our leaders, we took the suggestions from in-the-trenches systems engineers like yourself, we even had some ideas of our own, and upgraded the product. The rest of this space will explain the process and the product.

The Theme and Team Approach.

This was the message I delivered at the January 1998 International Workshop in Dallas when I re-assumed the helm of this publication. After begging forgiveness for past transgressions in delivering the product on time and in budget, I explained the approach, roles and responsibilities of my editing team for delivering the product and introducing theme issues.

The Team.

If you'll look on the left side of this page, you'll see ***INSIGHT*** now has an editing staff comprised of a Managing Editor, Advertisement Editor, Production Editor, and Layout and Design Editor. As systems engineers, we realize that when the job is complex or large, we must divide and conquer the work load, and define the interfaces between the components. As managing editor and a systems engineer, I feel very fortunate to have these terrific people on my team. These people know how to get the job done!

The Theme.

Starting with the Summer issue of ***INSIGHT***, each issue will dedicate eight to twelve pages to a specific theme. This section of the newsletter

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Highlights from the International Workshop

Newly Elected Officers

For elected INCOSE officers, the leadership year begins on Monday of the last week in January and concludes the following year. The Seventh Installation of Officers occurred on Monday, January 26 in Dallas, Texas, at the International Workshop. The Presiding and Installing Officer was the 1996 INCOSE President, Ginny Lentz.

Installed at this year's ceremonies were:

President: Bill Schoening
President Elect: Ken Ptack
Past President: Eric Honour
Treasurer: Pat Hale
Region I Director: Sam Alessi
Region II Director: John Clouet
Region III Director: Fariba Hozhabrafkan
Region IV Director: Nancy Rundlet
Region V Director: Tom Kabaservice
Region VI Director: Louis Doukas
Director at Large for the CAB: Ed Conroy.

Eric Honour, now officially a Past President, handed the first gavel engraved with 'INCOSE' to Bill Schoening, following the formal installation. Astutely, Eric had noticed during his tenure that his gavel had been inscribed with NCOSE, our past moniker.

Completing their two year terms on the Board of Directors are:

Secretary: Bill Miller
Region I Director: Ken Crowder
Region II Director: Elliot Axelband
Region III Director: Peter Brook
Region IV Director: Don Clausing
Region V Director: Harry Crisp

Region VI Director: Rob Halligan
Directors at Large: Mary Simpson and Brian McCay

Corporate Advisory Board

Ed Conroy, econroy@atdc.northgrum.com

The Corporate Advisory Board (CAB) had a well-represented meeting of nineteen members at the International Workshop in Dallas. The Board, as "Voices of the Customer," has the responsibility to fulfill the requirements of its charter, which is to:

- Provide advice and direction for symposia and committee activities
- Provide guidance on overall direction, focus and priorities
- Act as a conduit between INCOSE and the sponsoring corporation for information
- Work for improvements in Systems Engineering education

After review of documents under development since the August symposium in Los Angeles, the CAB got down to its primary task of reviewing INCOSE's direction and focus in order to provide guidance to the Board of Directors on the priorities to be considered for future decisions. This advice included fine-tuning on efforts already under way, as well as review and critique on proposed new efforts. The direction on which the CAB advised INCOSE included:

- Contribute toward a single SE capability model. Ensure the consistency of the model with emerging standards. Continue INCOSE's involvement in the DoD-directed Capability Maturity Model Integration (CMMI) effort as an affiliate society to NDIA, in order to further strengthen the combined model and its universal acceptance.
- Develop, distribute, and promote working group products to CAB members electronically for use on their corporate intranets. The CAB will volunteer its members for "beta" testing of INCOSE products.
- Compile case studies and lessons learned that demonstrate how SE adds value to business results, both from a success oriented history and documented failures, including root causes.

Upcoming activities that require CAB attention include:

- SE Center of Excellence (COE). The CAB believes that a SE COE has a good potential for success and will be the foundation of the

technical excellence required to continue growth of INCOSE.
- Local sponsorship: differentiation between local support (i.e., for chapter or symposia) vs support for the International Organization
- INCOSE should promote interdisciplinary integration of projects, both technical and administrative, and consider participating in more joint symposia with other technical societies (EIA, IEE, etc.) and management societies in order to attract more management personnel as members.

One new activity requested from the technical board is:

- Development of a skills/knowledge taxonomy for corporate internal SE training departments (allied with the new SE standards/models)

As part of the CAB discussions and decisions, 1998 goals were set and included:

- Increase diversity of CAB member companies to include more international, commercial, and government agencies, and obtain a broader representation of individual memberships from these types of organizations.
- Work with the leadership from merged companies to retain the original multiple memberships in order to enhance growth and participation.
- Better integrate CAB work efforts with the Board of Directors decisions/suggestions in order to get the CAB more proactive in the management of INCOSE.

The CAB represents twenty-two companies and one government agency (see listing in this issue), that are involved in the financial and voluntary support of INCOSE. About 53% of the total individual members of INCOSE are employed by the companies represented on the CAB. If your company is not represented, see your management about joining. Your company's membership will provide a unique opportunity to influence the direction and focus of INCOSE, from which both you and your employer can benefit. For more information on joining the CAB and the benefits of membership, see our web page on the INCOSE home page, (including answers to FAQs), or you can e-mail me for more information.

President's Corner

Bill Schoening, william.w.schoening@boeing.com

I am very excited about beginning my tenure as president of INCOSE. During the past year as President Elect, I have learned a good deal about the effort behind the substantial success of INCOSE and also about the challenges that face us over the next decade.

One of the areas of past success has been ***INSIGHT***. I am pleased that Valerie Gundrum is returning as managing editor, that we are returning to regular quarterly issues, and with the new look and direction of ***INSIGHT***. As INCOSE matures, so must its publications.

During 1997, the Board of Directors approved a Strategic Plan and developed a Technical Operating Plan (TOP) that implements the Strategic Plan. The TOP provides the framework for our technical and administrative committee plans for the next several years. With the TOP as a guide, I have selected six challenges for INCOSE that will set the direction and tone for much of the next decade.

1. ***Increased Globalization.*** INCOSE began as NCOSE in the U.S., but the value of joining the global SE community was quickly recognized. We joined forces with the Systems Engineering Society of Australia and have very energetic and growing chapters in Europe. Despite apparent obstacles, such as time zones that span 18 hours, language differences, and the cultural variations that come with having members in 18 countries, we must operate as a global organization. The leadership and participation in our working groups and committees is dominated by North Americans. My goal is to have 25% of our leaders be from outside the U.S. by mid-1999.

While we have substantial membership in Australia, we have few members in Asia. The challenge is to have 100 new members from Asia by the end of 1998.

GEC Marconi has become our first non-U.S. based CAB member. My final globalization challenge to be accomplished by the end of 1998 is to have at least three more CAB members whose base is outside the U.S.

2. ***Collaboration with Other Organizations.*** INCOSE has neither sufficient membership nor sufficient money to go it alone. We must collaborate with other organizations, as we have done previously in such endeavors as SE Standard EIA 632 and the SE capability model EIA-731. To continue this string of successes, the challenge is to have one new major success-

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President's Corner *continued from page 5*

ful collaboration in 1998, and I would like it to be an organization with a strong non-US base.

3. ***More Professionals and Fewer Volunteers Managing International Meetings.*** Our annual symposia and workshops continue to grow in success and size. Our volunteers from the host chapters have done an outstanding job, but along the way we are overwhelming the volunteers who commit incredible time and energy to producing these events. It is time to depend more on professional planning organizations. I believe it is possible to develop a workable transition plan that substantially reduces the workload on our volunteer members. Because of the long lead times associated with the annual symposium, we must begin now if we are to materially affect the symposia in 2000 and beyond.

4. ***Effective Succession Planning.*** Our officers, directors, and chairs of administrative and technical committees generally serve for two years. We cannot expect these volunteers to serve for longer periods, nor can we get caught searching for new leaders at the last moment. To be a mature and successful organization, we must seek and train reliable leaders, and we must provide these candidates with opportunities to gain experience in leading their peers.

5. ***Four Quality Journals Per Year.*** INCOSE has signed a contract with John Wiley, Inc. to publish four Journals per year. Not only is our reputation on the line to provide enough high quality articles, but we have made a financial commitment to Wiley so they would be our publisher. The challenge is maintain a quality Journal every quarter and a full pipeline of articles for forthcoming issues.

6. ***Advancing the State of the Art.*** INCOSE members must accelerate our research efforts for expanding the state of the art. It is not enough to refine what we do now. We must tackle the difficult problems. We need to able to answer questions like: How do I know that a set of requirements is complete? Are they consistent? Can they be translated into a feasible solution? Answers will not come quickly or easily. We do have some starting points, such as Wayne Wymore's proof about optimizing systems via the subsystems, or Gerard Le Lann's proof-based SE methods for computing systems and formal models and methods being developed by INCOSE's Requirements Working Group.

In our work environments we usually use mature methods with considerable experience bases. The initial results of our research may seem simplistic, the notations may be hard to understand, or the early applications may seem very narrow. But so was plane geometry before Euclid made it formal and simple. We must be tolerant and supportive of the early research initiatives.

My challenge is to have six papers at the 1999 Symposium that clearly and substantially stretch the state of the art.

These are important challenges. If realized, they will set the direction for INCOSE for years to come. I believe that they are realizable challenges, but they require effort on the part of all of us if we are to continue to thrive as an organization.

Technical Board Current Status

Donna Rhodes, Chair,
donna.rhodes@lmco.com

Leadership. The Technical Board continues to be chaired by Donna Rhodes in 1998. John Snoderly has been appointed co-chair, and will assume the Chair role in January 1999. Heinz Stoewer has also been appointed co-chair and will focus on increasing international participation in the technical community. Harry Crisp and Robert Halligan continue as the Board of Directors (BOD) representatives to the Technical Board. Stuart Arnold (UK), has been appointed as an international representative to the board. Terry Robar continues as Technical Board Assistant. Chairs and co-chairs from the Technical Committees (TCs) also serve on the Technical Board. Dennis Buede continues as Education & Research TC Chair. Bill Mackey (Chair) and Scott Jackson (Co-chair) lead the SE Applications TC. Rich Widmann (Chair) and John Worl (Co-chair) are the Measurement TC leads. Mark Sampson (Chair) and Dick Shaw (Co-chair) continue as Modeling & Tools TC leads. Elaine Hall (Co-chair) joins Rich Harwell (Chair) in leading the SE Management TC. Dick Wray has assumed the Chair role of the Processes & Methods TC. A Standards Technical Committee is in the formation stage, with John Snoderly as Acting Chair. There are currently 24 working/interest groups within the technical community.

Activities. The TB coordinated and submitted a response to the EIA 632 pink ballot, and has been working with the EIA author team to reach a resolution on INCOSE comments. During the March-April time frame, EIA 632 will undergo a second ballot, and EIA-IS-731 (the SE Capability Model) will undergo an EIA Pink Ballot. Jerry Lake represents INCOSE on the US TAG for ISO 15288, reporting to the Technical Board Chair.

The TC Chairs have been working with Kal Toth to sort, distribute, and coordinate review of the symposium papers. Terry Robar has led the TB's effort to work with the San Francisco Bay Chapter to transition the chapter's Systems Engineering Handbook to an INCOSE technical product. This product was approved at the Dallas International Workshop in January, and will be available for purchase from the INCOSE Central Office. Many thanks to Tim Robertson for serving as editor of the document.

Another recently approved product is the SE Brochure, completed as a joint product of INCOSE and AIAA under the leadership of Rich

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INCOSE '98 Summer Symposium

Vancouver – People, Teams and Systems

Jas Madhur, Symposium General Chair, jmadhur@rational.com

We are two years after the award date and have five months left to go. I am glad to say that the major components for the INCOSE '98 summer symposium are in place, and the team can now focus on the logistics of the week.

The major components that mark symposium success and have proven to be of interest to the INCOSE membership are:

- The Technical and Exhibits Program
- The Financial Picture
- The Social Program
- Innovation.

■ The Technical and Exhibits Program

(*Kal Toth, Art Morrison and Alice Kloosterboer*). In previous symposia, technical content ranks highest in attendee feedback as a reason for attendance. For the longest time we were concerned about how many people would turn up in Vancouver. However, based on the level of interest to our call for papers and tutorials, and from exhibitors commitments, we can expect a healthy technical program. The following figures provide an indication:

Papers:
Submitted (175) Accepted (113)
Posters (23)

Tutorials:
Submitted (23) Accepted (8)

Panels:
Submitted (15) Accepted (3)

Exhibits:
Booth Spaces (72) Sold (45)

■ The Financial Picture

(*Mike Wood, Ellen Barker and Mary Neudorffer*). The major sources of revenue for a symposium are registrants, tutorials, exhibits and patrons. The only 'certain' income until few weeks prior to the event is the money received through corporate patronage. This year, so far, we are grateful for the generous support from the following corporations:

- The Boeing Company
- Raytheon Company
- AlliedSignal, Inc.
- Rational Software Corporation
- MacDonald Dettwiler.

■ The Social Program

(*Nadia Marchant and Deb Gray*). Vancouver is a spectacular and very friendly city. The best way to enjoy it is to get out and about. I encourage you to attend our ice-breakers, and take advantage of our downtown symposium sites, where you can walk to nearby restaurants, shops and galleries. In addition, we planned our optional harbour cruise around a Vancouver-sponsored 'fireworks' night. The cruise will provide you an incredible vantage point of the city.

■ Innovation

This is the first INCOSE symposium being held outside the United States. We have worked together as a distributed team to draw on best practices and proven expertise. Vancouver '98 will carry on the hallmarks of preceding symposia. In addition, an International Panel will be held the morning of the last day in order to build on the theme of *People, Teams and Systems – Across National Boundaries*. The decision to do this was based on the success of the International Forum in '97 and will be open to all attendees.

The final events on the program are the Technical Tours. Accompanying the tours of local companies, there will be a 'virtual tour' of the Jet Propulsion Lab (Pasadena) as a follow-on to the tour held there last year.

In addition to all of this, we are excited about our guest speakers, each of whom will address the topic of *Fostering Innovation* from the people, teams and systems perspective. Dr. John MacDonald will speak of this in the context of building a company. Michael Schrage, as the author of *No More Teams* will lend his own slant, and Chief Leonard George will speak on providing a vision to a people in a 'living system.'

On behalf of the Vancouver team preparing for this symposium, we are excited about to this spectacular event and look forward to seeing you there!

From the Editor: *continued from page 3*

will be led by a theme editor, a specialist in the topic area. The theme editor's responsibilities include soliciting authors, focusing the theme, editing material, and delivering the resultant product, on time, for publication. As a temporary member of my editing team, the theme editor will guide the content and advertisement approach for that issue. I am very pleased to announce that the themes and editors for the Summer and Fall issues have already been determined. Please welcome Pat Sweeney (SE in Commercial and Public Interest Application Domains) and Jerry Fisher (Modeling and Simulation) to my staff for the Summer and Fall issues, respectively.

I hope you find that this upgrade meets your needs and interests as systems engineers and information consumers.

Valerie Gundrum
Managing Editor

July 26-30
1998
Vancouver, B.C., Canada

INCOSE VANCOUVER
PEOPLE, TEAMS 98 AND SYSTEMS

INCOSE '98 PATRONS...To Date

The Patron firms supporting INCOSE '98 strongly enhance the quality of the symposium. The Planning Committee wishes to recognize this year's Patrons:

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Platinum	♦ **Raytheon Company**	http://www.raytheon.com
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	♦ **Rational Software Corporation**	http://www.rational.com
	♦ **The Aerospace Corporation**	http://www.aero.org
Bronze	♦ **MacDonald Dettwiler**	http://www.mda.ca

For more information regarding the Patron program, please contact Mary Neudorffer at (310) 336-2870.

Working Groups

Report of the INCOSE Measurement Working Group (MWG) Meetings at the International Workshop

Garry Roedler, Chair, garry.j.roedler@lmco.com

The Measurement Working Group (MWG) held very successful meetings during the INCOSE International Workshop in Dallas, Texas from 26-29 January 1998. The MWG met every day of the workshop and the meetings were very well attended. This year's workshop included a very full agenda and resulted in some significant accomplishments.

The Systems Engineering Measurement Primer was completed prior to the Winter Workshop and was reviewed by the MWG and Measurement Technical Committee (MTC) at the workshop. After comments were resolved and incorporated, the Primer received approval from the MWG and MTC to be released as an informational product and to be submitted to the Technical Board for review and approval as an INCOSE Technical Paper. Approval from the Technical Board was received at the end of February. The MWG would like to thank the co-authors of the Primer: Garry Roedler, Jennifer Dunn, Dr. Donna Rhodes, Dr. William Farr, Cathy Tilton, Richard Widmann, and Patrick Antony.

A one-day workshop session was led by Garry Roedler (Lockheed Martin Management and Data Systems) as a kick-off of the collaborative effort between the INCOSE MWG and the Practical Software Measurement (PSM) project for the development of joint Practical Systems Measurement guidance products and services. Both the Project Plan and the guidebook outline were reviewed and revised to reflect achievable goals, realistic scope, and current technology trends. Since the technology environment is increasingly heading towards integrated systems and software approaches, the team also composed an alternative product development and delivery approach that integrates systems and software measurement into a single product line and maximizes the use of HTML/web technology. Finally, the team derived a draft set of common issues, measurement categories, and measures for the engineering of systems. These will be further developed and refined over the next year.

Dr. William Farr (Naval Surface Warfare Center) led a discussion of new requirements that were received from users of the Metrics Information Systems Tool (MIST), an online tool to aid understanding and selection of appropriate measures. As a result of this discussion, the enhancement requirements were prioritized based on the value added from each enhancement and the difficulty to implement them. The current goal is to have all changes incorporated in time to provide distribution of Version 2.0 at the INCOSE Symposium in July. The current beta version is available for download through the web site of Distributive Data Systems (www.distributive.com). It will also be placed on the INCOSE web site after the web site upgrades are completed and MIST version 2.0 is complete. The download includes instructions for setup.

Peter Baxter (Distributive Data Systems) led a discussion that focused on the refinement and use of measurement tool requirements. At the 1997 INCOSE Symposium, the MWG put together an initial set of high level requirements for measurements tools, which were included in tool surveys to vendors through the Tools Database Working Group, to obtain a list of tools that meet some or all of the requirements. Since that time, Peter Baxter sent out questionnaires to MWG members to obtain information to derive more detailed requirements. A total of 321 comments were provided and subsequently summarized into a draft requirements document. These requirements now need to be consolidated under a well-defined set of objectives in order to group the requirements for the identification of tools for specific measurement tasks or influencing the development plans of tool vendors. Chris Miller (Lockheed Martin Management and Data Systems) will work with Peter to develop and implement a project plan for the Measurement Tool Requirements project. This work will be coordinated with the Tools Database Working Group and the Requirements Management Tool Survey effort to ensure the integration of the effort across INCOSE and maximize benefit from the effort.

Lessons learned reports were presented to the MWG by two of our members. Dorothy McKinney (Lockheed Martin Missiles and Space) presented lessons learned for the use of metrics up the chain of command. Dennis Brink (Raytheon Systems Company) presented lessons learned in defining integrated metrics plans for large, object oriented programs. Both presentations were highly informative and stimulated discussion in the MWG. Summaries of measurement lessons learned will soon be available through the MWG web page.

Our technical environment is influenced and controlled by a set of standards and frameworks that continue to change. Due to this evolution, we asked Don Gantzer (TRW) to present on "Measurement Related to Frameworks and Standards." Don's presentation covered measurement requirements for the

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SW-CMM, SE-CMM, ISO-9000, and the key standards.

The MWG believes that INCOSE needs to start developing products that integrate the focus areas of its working groups, and to ensure that its products are consistent regardless of which working group produces them. INCOSE also needs to ensure that their products are consistent with the existing and emerging standards and guidance in the overall technical community. In order to facilitate achievement of this product integration, the MWG established and initiated a plan for technical exchange and coordination with other technical organizations (e.g., PSM, IEEE) and INCOSE Working Groups. Each working member of the MWG has volunteered to be a liaison with one of these organizations or groups and periodically report back to the MWG.

As part of the effort to coordinate with other organizations, Dennis Brink (Raytheon Systems) led a discussion regarding potential ongoing coordination and potential collaboration with IEEE. The IEEE Standards Committee is now beginning to work more in the area of Systems Engineering standards and is interested in starting SE metrics standards as part of that area. John Harauz will be in charge of the SE standards work for IEEE and has expressed enthusiastic interest in collaboration with INCOSE. He has already provided us with copies of all the work they currently have in progress. He requested copies of the INCOSE MWG documents and products to familiarize himself with our work. The MWG unanimously supported pursuing approval for a Memorandum of Understanding with IEEE, and for provision of a copy of our documents and products.

The Measurement FAQ (Frequently Asked Questions) database was reviewed to determine whether the FAQs had responses that were adequate and consistent with the MWG guidance. This project is led by Ken Stranc of TASC. (Former project lead was Terry Treadwell, also of TASC.) FAQs will be selected for inclusion in each issue of ***INSIGHT*** These FAQs will soon also be available through the MWG web page.

Finally, the INCOSE Technical Products and Services Plan was reviewed and modifications were identified to reflect the MWG's current set of available, in-progress, and planned products and services.

For further information regarding the INCOSE Measurement Working Group, contact:

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Measurement: Frequently Asked Questions

Ken Stranc, kjstranc@tasc.com

Question: Why did the Metrics Working Group change its name to the Measurement Working Group? What is a "metric" anyway?

Response: There are two reasons why the name was changed—first because of the ambiguity with the term "metric," and second, to stress the group's focus on process.

Through common use, the term "metrics" has taken on several diverse meanings among engineers. This has led to mistaken perceptions regarding the purpose of this working group. We decided to change to a name that has a more precise and universally understood meaning and more accurately reflects our purpose. The term "measurement" was chosen because it meets both of these objectives. The Measurement Working Group's focus is much broader than the set of metrics or indicators that are analyzed. Our focus includes the entire process of measurement, from the identification of issues requiring insight and the selection of applicable measures through the analysis of the measures, reporting of the results, and determination of actions required. The following definitions of the terms "metric" and "measurement" are extracted from the recently released ***Systems Engineering Measurement Primer*** published by INCOSE as a product of the Measurement Working Group.

Within INCOSE, the Practical Software Measurement group, and other organizations, the currently accepted definition of the term "metric" is synonymous with that of "indicator." An indicator (metric) is defined as:

1) A measure or combination of measures that provides insight into an issue or concept. Indicators are often comparisons, such as planned versus actual measures, which are usually presented as graphs or tables. Indicators can describe the current situation (current indicators) or predict the future situation (leading indicators) with respect to an issue. (Adapted from ***Practical Software Measurement.***)

2) A mathematical composite of relevant, quantifiable, product, project, progress or process attributes (measures) taken over time that communicate important information about quality, processes, technology, products, projects, and/or resources.

Measurement is defined as "The process of assigning numerical values to process, product, or project attributes according to defined criteria. This process can be based on estimation or direct measurement. Estimation results in planned or expected measures. Direct measurement results in actual measures."

Question: How does measurement help me?

Response: Measurement helps you by providing meaningful information regarding the quality, adequacy, cost, and/or progress of process, project, and/or products.

Measurement can offer the insight

needed for planning, controlling, managing, and improving the following:

- product technical adequacy and performance
- schedule and progress
- resources and cost
- growth and stability
- product quality
- life-cycle process performance
- technology effectiveness
- customer satisfaction.

Measurement provides you with the information you need to gain early insight into potential problems and to make changes to avoid them (risk management). Similarly, measurement often uncovers opportunities allowing you to take full advantage of them. When performed rigorously, measurement provides unambiguous quantitative information upon which to justify decisions or recommendations to your customer, your management, and your project team.

Progress Report from the Tools Integration Working Group

James Schier, Chair,
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During the International Workshop held January 26-28, 1998, in Dallas, Texas, the Tools Integration and Interoperability Working Group (TIWG) worked almost continuously throughout the workshop. As a result, members felt that this was the most productive workshop that we have held. The following TIWG members attended:

Jim Schier, TASC, TIWG Chairman
John Nallon, TD Technologies, TIWG Co-Chairman
Eileen Arnold, Rockwell Collins
Dale Griffiths, SCITOR
Carol Gutierrez, Ascent Logic Corp.
Greg Niemann, Lockheed Martin

The TIWG is under the umbrella of the Modeling and Tools Technical Committee. In joint meetings with other working groups in this committee, we coordinated our activities with the other working groups and interest groups, such as the Tools Database Working Group (TDWG) and the Model Driven Design Interest Group.

The Technical Committee meetings confirmed our plans for an integrated set of products with other working groups. The Information Modeling and Processes Interest Group (IMPIG) is responsible for development of the systems engineering functional decomposition. This functional hierarchy has been used by the Tools Database WG as the basis for their tool categorization and was implemented on the INCOSE web site for the Tools Database. (Bill McMullen reported that 25% of all hits on the INCOSE web site are tool related making the Tools Database the most popular on-line service provided by INCOSE.) The Tools Database WG worked during the workshop to add Risk Management tools as their next category, based on the input from the Risk Management WG.

A concept for an expansion of the current functional hierarchy was developed and approved by the MTTC. The expanded functional hierarchy will be used to organize requirements in the Integrated System Engineering Environment (ISEE) System Requirements Document (SRD) by function and capability. Eventually, the Tools Database WG will use the expanded functional hierarchy to refine its tool surveys and update the Tools Database. This will enable vendors to respond to survey questions at the capability level based on the detailed set of requirements for each capability. As shown in the figure below, the intended result is that INCOSE products will provide benefit to both tool vendors and tool users. This concept was well received at the closing Plenary session of the workshop.

Our opening meeting at the workshop was attended by three members of the Measurement WG (formerly the Metrics WG) including Don Gantzer, Peter Baxter, and Ken Stranc. By sharing purposes and plans, we stimulated sufficient mutual interest to include metrics and measurement in our scenarios; and to present our plans to the Measurement WG. As a result, the Measurement WG agreed to help co-author the ISEE operational scenarios that involved measurement. Don Gantzer of TRW was appointed Measurement WG representative to the TIWG.

Members of the TIWG were hard at work on the following scenarios:

1. Risk Management: Eileen Arnold
2. Integrating Requirements Management and Performance Analysis: Greg Niemann
3. Using the Internet for Managing Systems Engineering: Dale Griffiths
4. Engineering Data Management: Carol Gutierrez

Greg and Dale completed partial drafts of their scenarios at the Workshop. Eileen and Carol nearly completed first drafts of their scenarios. Jim Schier organized the ISEE Concepts of Operations (Conops) document, which needs a technical approach to integrate the scenarios as they are developed. John Nallon updated the ISEE SRD based on review comments. Jim and John worked together on re-organizing the ISEE SRD to use the functional hierarchy and better integrate the material already in it.

As a result of the Workshop, we expect to produce a report for the 8th International Symposium Proceedings, Volume II, with the following contents:

- A status report on the progress of the TIWG, its expanded functional hierarchy and improved concepts for using the TIWG's products
- An outline of the ISEE Concepts of Operations (Conops)
- An outline of the ISEE SRD
- Seven possible operations scenarios

continued on page 13

Why Program Managers are Adopting a Model-Based Approach To System Engineering

by INCOSE Model Driven System Design (MDSD) Working Group

System engineers build *models* to better understand problems, develop candidate solutions, and validate their decisions. Different kinds of models are built to help focus on the appropriate set of questions that need answering in order to find the most reliable and cost effective solutions and to qualify the design against its requirements. The problem has been that these knowledge-rich engineering models, developed on an ad hoc, informal basis, were not formally retained as part of the performance specification. Therefore they were not available to support down-stream development/test activities, or future operation and maintenance changes.

This article summarizes the general concepts of a model-based system engineering process. First, a definition of *model* will be presented, followed by a high level description of how models are used to support the system engineering process. A more detailed description of the model-based approach, and its characteristics, are being developed by the Model Driven System Design (MDSD) Working group, for publication in the Fall '98 issue of ***INSIGHT***.

Definition of Model

A model is a limited representation of a system or process. The role of a model is to answer questions about the entity it represents. Model types include: executable, information, design, operations, process, enterprise and organization. Models can evolve into a cohesive unambiguous representation of a system. Verification and Validation activities interrogate the system model, then progressively iterate on adjustments to requirements and design until completeness and quality criteria are satisfied.

Modeling and model interrogation provide an effective means for obtaining factual information about a system. In component design it is often feasible to build several prototypes, test them, and then modify the design based on test results. This is scarcely ever possible in system development for reasons of cost, complexity and availability. System decisions must be based on interrogation of a model of the system, not from the system itself. The following model types are commonly used:

- Schematic Model: A chart or diagram, having an underlying machine readable representation, which shows object relationships, structure, time sequencing of actions (e.g., organizational chart, spec tree, operational sequence diagram, interface diagram, state diagram, PERT network diagram, functional-flow block diagram).
- Performance Model: An executable structure which represents system response to external stimuli.
- Design Model: A "machine interrogateable" version of the system detailed design, usually represented by CAD drawings, VHDL, C, etc.
- Physical Model: Tangible physical equivalents used for reality experimentation and demonstration (e.g., DNA model or model airplane in a wind tunnel).

If models are jointly developed in a concurrent engineering environment and shared across an electronic network, the communications demand on requirements, design, and verification engineers can be greatly reduced. For the greatest benefit, several modern concepts may be integrated with the modeling process. These include concurrent engineering, object oriented design, and on-line communications between program engineers. Key program benefits derived from a model-based system engineering approach are as follows:

- The power to express complex information in ways that are easily understood. Models can achieve this expressive power through physical representations, graphics, animation, 3-D representations, and the use of color. Hierarchical decomposition of models supports visibility of information at its level of relevance. The associated "decluttering" of design information is extremely effective in enabling engineers to "see" the critical issues at a particular design level.
- Rigor of the models helps avoid ambiguities, mistakes, and rework.
- More exhaustive search for optimal solutions is possible because the models are computer executable.
- Status of designs, processes and compliance is visible and traceable as a direct result of the model.
- Linkage between hardware, software, and other design elements is provided. This is important throughout the life cycle. It enables system level interfacing errors to be identified early and minimizes surprises during the design qualification phase.
- Models, and their components and rationale, are available for reuse on future programs.

Overview Of Model-Based Approach

The model-based approach to system engineering is fundamentally similar to those approaches generally used in the industry (e.g., IEEE 1220, EIA 632, etc.). However, in the model-based approach the basic activities associated with requirements definition, functional analysis, architecture

definition, and verification/validation, are accomplished through development of increasingly detailed executable models. Some of the distinctive features of the model-based approach are summarized below by system development phase.

System Requirements Definition

The major events of this phase are:

a) Completion of system requirement specifications, preliminary subsystem specifications, and subsystem interface specifications in machine-readable (and human-readable) form.
b) Completion of a system performance model in sufficient detail to respond to all specifications in (a) above. The system model may comprise models of reused components.
c) Execution of the system performance model to show that the system/subsystem specification is consistent with cost, schedule and technical performance requirements.
d) Completion of technical reviews appropriate to the system definition stage, to include system model validation.

The most important concept in this phase is that system requirements are integral to the system model, and they are in an executable form. The role of performance oriented modeling is to assess design feasibility of the system requirements and to make technology and architecture decisions. Testing is oriented to ensuring that models used to make these decisions were sufficiently accurate. Customer interaction with the models affirm that the right system is being built.

Preliminary System Design

The preliminary system design phase initiates subsystem design and creates subsystem-level models, executable specifications and machine-readable design-to baselines to guide component development. Execution of the models against the design-to baseline shows preliminary compliance with specifications.

Detailed Design

The detailed design phase of the system life cycle completes subsystem design and models down to the lowest component and creates an executable component specification, model, and machine-readable build-to component baseline for each component. Execution of the models demonstrates satisfactory preliminary compliance with performance specifications and satisfactory final compliance with design constraints. At the completion of this phase all design decisions have been made. Except for changes, design freedoms have been exercised. The design is represented in machine-readable form, so that the detailed design can be interrogated for compliance with design constraints. These are limitations on the range of permitted design solutions. They include such things as dimensional limits, material selection and colors. Performance models have been validated by developmental tests and analyses, and execution of these models shows that production articles built to the detailed design will be compliant with the specifications.

Design Qualification

During this phase, performance models are validated against data taken on test articles manufactured in accordance with the build-to baseline. Execution of the validated performance models shows satisfactory compliance with performance specifications. Models are updated to respond to data collected during integration and test. Models are validated and approved for use in closing requirements. At functional configuration audits, requirements are checked for closure against results of model execution. By the completion of this phase, the extent of compliance of any specification requirement can be discovered by interrogating the system model.

In the early phases of system development, one would like to examine many designs to discover the most suitable. By the end of the Detailed Design phase, the project is considering only one design, the build-to baseline. In early phases the models are low fidelity and geared towards decision making; eventually models become sufficiently faithful for compliance assessment.

Conclusion

Model-based system engineering offers rigor in specifying and verifying systems and/or processes. It supports continuous assessment of consistency between requirements, design, and verification. The improved visibility, and understanding, by the program engineers through the use of models offers the opportunity for dramatic gains in productivity, product quality, and time to market.

Tools Integration WG: *continued from page 11*

By April 3, we hope to complete our scenarios and submit our report. Our schedule relies on reviewers to flesh out ideas, ask questions for clarification, and to point out deficiencies. TIWG members who were unable to attend the workshop have been asked to review one scenario apiece. This is an efficient way for other volunteers to participate and requires only a few hours of work. Interested parties are requested to use the TIWG reflector to let us know of your willingness to help (tiwg@tdtech.com).

Due to a conflict with a major review, no representative from the Systems Engineering Data Representation and Exchange Standard (SEDRES) effort was able to attend. However, Julian Johnson did provide the first SEDRES Newsletter to keep us abreast of their progress. This is a funded program sponsored by the European organization, ESPRIT, with participation from major European corporations and universities, to develop a platform independent ISO standard for communicating systems engineering information between tools.

INCOSE Online

E-Mail Reflectors

Randy Case, Chair Communication Committee, rcase@gar.esys.com

There are two main e-mail lists (or reflectors) that are for INCOSE member use. These lists are ***NOT*** for job postings, tool sales, or workshops (unless these are INCOSE sponsored).

The discussion list is a forum for discussion of questions, issues, lessons learned, best practices, research topics, and sources of additional information on systems engineering. For INCOSE members to subscribe, send e-mail to:

incose-discuss-request@xor.com

with the following command in the body of your e-mail:

subscribe incose-discuss your_e-mail_address

If, for some reason, you wish to be removed from the discussion list, send e-mail to:

incose-discuss-request@xor.com

with the following command in the body of your e-mail:

unsubscribe incose-discuss your_e-mail_address

To post a message, send e-mail to:

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The discussion list is not moderated, and anyone can post to it. There are currently 380 INCOSE members (and affiliates) on the list.

The administrative list is devoted to announcements of INCOSE and systems engineering related meetings, workshops, publications, and communication of INCOSE business to the membership. It is a moderated list. To subscribe, send e-mail to:

incose-admin-request@xor.com

with the following command in the body of your e-mail:

subscribe incose-admin your_e-mail_address

If, for some reason, you wish to be removed from the list, send e-mail to:

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To post a message, send e-mail to:

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There are currently 380 INCOSE members (and affiliates) on the administrative list.

What's On the INCOSE Website

Visit the INCOSE website at www.incose.org for pertinent information on chapter activities, membership, organizational contacts, work products, and ***INSIGHT*** submission. Examples of what you can find:

- ***AIAA/INCOSE SE Brochure.*** A professional 15-page publication on the value and benefit of using systems engineering. This brochure is well-suited for important presentations and for marketing INCOSE to potential members. This brochure can be accessed from the home page.
- ***Membership Information.*** This is where membership benefits and application information is available to long-standing, as well as potential members. There is also information on chapters and contacts in your geographic area.
- ***Vancouver Symposium Author's Guide.*** Adobe Acrobat templates are available to symposium authors.
- ***Technical Work Products.*** You can purchase INCOSE books, guide books, primers, symposia proceedings, and other materials. Look in the documents and resources section.
- ***INSIGHT Submission Information.*** Available through the documents and resources section, you can find points of contact, submission deadlines, and themes for upcoming issues. Also provided are criteria for advertisement submissions.
- ***Contact Information.*** Phone and e-mail information for everyone in the INCOSE infrastructure, including the president, board members, CAB members, technical committees, administrative committees, regional directors, and chapter officers. There

are also hotlinks to many of these people and to the INCOSE Central Office.

■ Coming Soon to the INCOSE Website

By the end of March, the following items will be available on the INCOSE website:

- ***Systems Engineering Journal — Call for Papers.*** This will provide detailed information for authors for paper submission to *Systems Engineering*.
- ***Measurement Primer.*** INCOSE's newest approved technical publication will soon be available for ordering from the documents and resources section.

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People on the Move

Cecilia Haskins, who worked in France for most of 1997, recently accepted a position with a national consulting firm in Bergen, Norway, and started in January 1998. She has been applying her experiences as a systems engineer to the improvement of internal processes. To this end she reports that the INCOSE proceedings have supplied her with a wealth of material to share with her co-workers and employers. Aside from some linguistic challenges, Cecilia has been enjoying her European adventures and can continue to be reached electronically at 100437.3555@compuserve.com.

Harshavardhan Karandikar, has left Science Applications International Corporation (SAIC) to work for ABB Corporate Research Center, located in Germany. He would be delighted to hear from any of his peers at his new address:

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Fax: +49 6221 596253
e-mail: dhamaka@decrc.abb.de

After 20 years with IBM Federal Systems (Houston, TX and Bethesda, MD), then Loral (Rockville, MD) and then Lockheed Martin's Software and Systems Resource Center (Gaithersburg, MD), **Ron Kohl** has joined Intermetrics Inc., as their Chief Systems Engineer for their NASA OMNIBUS contract. In his new role, Ron will be involved in many aspects of the Space Shuttle Flight Software and the Space Station C&DH Software Independent Verification and Validation (IV&V) projects. In addition, Ron will be involved in other activities with the NASA IV&V Center and other corporate efforts. Ron is located at the NASA IV&V Center in Fairmont, WV. As an INCOSE member, Ron remains an active member of the Systems Architecture Working Group and Measurements Working Group. He is also an IEEE member (Architecture Working Group) and an AIAA member (chair of the Software Systems Technical Committee).

Dona Lee has joined Dynamics Systems in Alexandria, VA as a systems engineer working on projects in support of the Navy Acquisition Reform Office. Dona received her Masters in Systems Engineering this past year from Virginia Tech. You can reach Dona at dnwlee@moon.jic.com.

News from Chapters

Don Black Speaks Out at LA Chapter Meeting!

James A. Sanchez, jsanchez3@mail.hac.com

Mr. Don V. Black spoke on January 13, 1998 at the first meeting of the rejuvenated Los Angeles Chapter of the International Council on Systems Engineering. Mr. Black, of DVB Development Services, gave his personal perspective on Systems Engineering Processes (SEP) over the last forty years. He described fundamentals of SEP, gave personal statements of SEP lessons learned and provided a brief look at the future in terms of those lessons.

About forty middle- to senior-aged practitioners of Systems Engineering braved an unusually cool and wet Los Angeles winter. Mr. Black had a recurring theme to his presentation: SEP management is a critical, yet neglected part of systems engineering (SE). He began by pointing out that SE is a process tailored to a particular program, and not a discipline. He emphasized that SEP is the most valuable tool that a program manager can use. He observed that the failure of many programs can be traced, in part, to industry's lack of SEP management. He noted that the numerous DoD acquisition reforms are traceable, in part, to industry's failure to properly use SEP. He admonished the universities and industry for inadequate teaching of SEP management.

Dr. George Friedman responded in defense of academia, but relented that USC's Industrial Engineering course work might benefit from more management training.

Mr. Black went on to support his perspective by reviewing systems engineering during the 1950s, 1960s and 1970s. He noted that in the 1950s systems were deployed in 5 to 10 years, and developed with a minimum of paperwork and reviews. By the 1970s the time-to-deploy exceeded ten years, Congressional oversight, paperwork and reviews had increased substantially, and there were a number of notable programs that were poorly managed.

Today, deployment of systems exceeds fifteen years, there is a significant expansion in acquisition reform, significant growth in computer and communication technologies, and SEP is getting more attention. Mr. Black perceives that the lessons learned from the past are still pertinent:

- SEP can be effective in winning competitive proposals
- Use of SEP in program management can be a key to success
- Effective use of SEP requires commitment from executives
- Organization responsible for SEP must be with the technical lead
- Effective use of SEP will provide what the customer wants
- Readily available SEP database contributes to team building, customer trust, traceability and communication

He closed by suggesting that as individual practitioners of SE we can:

- Apply the SEP wherever given the authority
- Respond to acquisition reform by understanding the underlying problems
- Convince management to provide executive level SE training
- Have a life-cycle view of the system
- Continue SE training
- Include management techniques for the SEP to assist in total program management
- Support and promote INCOSE

Mr. Black started his career as a US Air Force pilot from 1942 to 1947. Afterward, he attended the University of Michigan, and obtained BS and MS degrees in Aeronautical Engineering with majors in automatic control systems and fluid dynamics. He joined McDonnell Douglas in 1952, retiring in 1988 as Vice President - General Manager of the Command, Control, Communications and Intelligence Product Line where he managed $300MM/year in sales, 1,000 employees, 40 contracts and numerous subcontractors. He went on to establish the Development Services Corporation where he has worked with many of the major aerospace contractors in the areas of new business development, system engineering and program management. Mr. Black can be reached on the Internet at 73751.464@compuserve.com.

Silver State

Jesse Teal, jesse_teal@ymp.notes.gov

In January 1997, the Silver State and Inland Empire chapters jointly hosted the INCOSE International Workshop. Several dinner-speaker meetings were held and a tutorial on the Engineering of Complex Systems was taught by Brian Mar and Barney Morais. The membership of the chapter has significantly increased and now exceeds 40 members.

Our goals for 1998 are to continue to expand the membership and increase member involvement in INCOSE affairs, as well as provide opportunities for education and enrichment in Systems Engineering. Several speaker meetings and at least one tutorial are planned for the year.

On April 30, 1998, the Silver State Chapter and the University of Nevada, Las Vegas (UNLV) will celebrate, for the first time, the award of certificates to students who are completing the SE Certificate Program, which is co-sponsored by the chapter. The two-year program consists of five courses: SE Introduction and Management, System Concept Development and Selection, System Requirement Definition and Analysis, System Design and Integration, and System Verification.

Space Coast Chapter Installs Officers

gdelaney@worldnet.att.net

The Space Coast Chapter began the new year with the installation of officers at a dinner meeting on January 20, 1998 at the Patrick AFB Officers Club. After introductory remarks by Region V Director, Tom Kabaservice, INCOSE Past President, Eric Honour, installed the new officers, including:

- President: Joseph Sobierajski
- Vice President: Scott Shenton
- Treasurer: Gerard M. Delaney
- Director, Programs: Elaine Hall
- Director, Membership: Terry de la Moriniere
- Director, Communications: Paul Crawford
- Director at Large: Beth Findley

After dinner, Eric reprised the address he gave at the first joint European Space Agency (ESA)/ INCOSE seminar on systems engineering at the European Space Research and Technology Center (ESTEC), in Noordwijk, the Netherlands. The interest in Systems Engineering in Europe appears to be strong.

SCC goes to the International Workshop without leaving Florida. At the meeting on February 3, members of the Space Coast Chapter were presented summaries of several of the key events of the International Workshop in Dallas. Eric Honour, SCC founding member, presented the State of INCOSE, which highlighted the history of INCOSE, its accomplishments and continuing challenges.

Of special interest is the increasing recognition of INCOSE as a source of Systems Engineering knowledge and experience for government and other technical and professional organizations. INCOSE has been asked to participate in a number of SE related activities, including the development of the EIA and ISO standards for systems engineering, and in the harmonization of the Systems Engineering maturity models. INCOSE has several efforts underway to improve its prestige and credibility, including the publication of the journal *Systems Engineering,* and increasing membership in the US and internationally. Tom Kabaservice reported on the Board of Directors activities, including the true internationalization of the Board with the election of the first European Director for Region III.

Elaine Hall talked about the activities of the Risk Management Working Group. Beth Findley discussed the Requirements Management Working Groups accomplishments. Of particular interest here is the development of a website with information about various requirements management tools, ranging from word processors and spread sheets to full fledged specialized tools.

Also at the meeting was Susan Hutchinson, chairperson of the Canaveral Council of Technical Societies CCTS, a local umbrella group of technical and professional organizations including the SCC. Susan wanted to acquaint herself with INCOSE SCC and inform us about the CCTS and its activities. An upcoming activity is the National Space Congress, to be held in Cocoa Beach April 28 through May 1.

Central Florida Chapter Relocation

Ben Berauer,Vice President,
bfbc@eci-esyst. com

Relocation of the Central Florida Chapter from the Orlando area to the Tampa Bay area has been completed successfully. For the first time, the Tampa Bay technical community is directly tied to an organization dedicated to the betterment of the systems engineering profession! Engineers at Raytheon Systems Company, St. Petersburg, were instrumental in getting the effort underway. Their enthusiasm has revitalized the Central Florida Chapter and helped obtain official chapter status and realize the associated benefits immediately. Members elected four executive officers and eight directors at-large to represent our 43 members spread throughout the western half of the Florida peninsula.

In January we published our first monthly newsletter and set up an independent web page. The chapter's web site, www.netcom.com/~rlmrchnt, provides information on local INCOSE meetings, programs, and activities. We plan to hold monthly meetings with a variety of programs slated for 1998. Details and new announcements will be found on the web site.

Approximately half of the membership attended the first chapter meeting of the year on February 3. The meeting served as a forum for our vice president, Ben Berauer, to recap important events at the recent International Workshop. We found "Lessons Learned" exchanges among the Chapter and Membership Committee participants to be extremely beneficial. Our primary challenges echo that of the other chapters:

- Retaining current members and continually attracting new ones
- Gaining active participation from a broad segment of the membership
- Involving members residing at the farther reaches of the region.

During the month of March we will inaugurate committees to implement programs, expand membership, revise bylaws, and develop substantive information for distribution through chapter and central organization communication channels.

1998 Board of Directors

President: Frank Dougherty (FrancisDougherty@ij.net)
Vice President: Ben Berauer (bfbc@eci-esyst.com)
Treasurer: Bob Marchant (rlmrchnt@ix.netcom.com)
Secretary: Wes Calhoun (wescal@cftnet.com)

Directors-at-large:
Ed Kerpsack, Ronald A. Brown, David Cleotelis, Frank Roth, Thomas Bougas, Ken Beatty, Robert Blazek, and William H. Mosley, Jr.

Central Arizona Chapter to Host 1999 International Workshop

The Central Arizona Chapter has accepted the honor of sponsoring the INCOSE 1999 International Workshop. The Workshop will be held in the Phoenix/Scottsdale area on January 25-28, 1999. Look for more details in future editions of ***INSIGHT.*** Contact either of the International Committee co-chairs, George Anderson (GAnderso@space.honeywell.com) or Joe Juarez (Joseph.Juarez@cas.honeywell.com) for additional information.

San Francisco Bay Area

Lew Lee, President, lew@svl.trw.com

We continue to attract high attendance at our monthly meetings. During the past few months, we have enjoyed the following talks:

2/10/98, Susan M. Osborn, Ph.D., Applied Systems Thinking: *A Systemic Approach to Stress Busting*

1/13/98, Dr. John Lathrop, *Analysis Using Subjective Judgment in Strategic Decisions — Bridging the Disconnect Between Strategic Management and Analysis*

12/9/97, Dr. James L. Adams, Stanford University, *Creativity vs. Control — Innovation in Organizations*

11/11/97, Panelists: Theodore A. Dolton, Dr. William Cutler, Andrew Koehler (U.C. Berkeley), *Panel Discussion New Arenas for Applying Systems Engineering — A Systems Engineering Applications*

10/11/97, Dr. James Kowalik, *Renaissance Leadership Institute, Creating Breakthrough Products — Use of the TRIZ Approach to Create Impossible-To-Compete-With Products*

9/9/97, Dr. Charles Darrah, San Jose State University, *Anthropologists on the Loose in Silicon Valley!*

Through the generosity of GTE Government Systems in Mountain View where we meet monthly, we obtain the benefit of having our monthly programs videotaped. This allows members who are not able to attend to still have the opportunity to receive the same information.

In December, chapter officers and board elections were held. We are extremely fortunate to have a large and active board. Please meet them on our website at www.relay.net/~lew/officers.html.

In January, chapter member Dr. William Cutler presented SFBAC's first tutorial of the year, "The SuperSystem Process™: Managing Complex Public Policy Issues." The tutorial fulfilled the aspiration for community outreach and was supported by members of the INCOSE Resource Management Interest Group.

We're planning to have additional tutorials throughout the year. To better serve our membership, we will conduct an all-members survey. We predict the 1998 survey will be as successful as the one conducted in 1995 which serves as the foundation for our popular suite of services.

Upcoming events for the San Francisco Bay Area chapter are open to all members and INCOSE visitors from elsewhere. For more information on our activities, check out our website at www.relay.net/~lew/sfbac.html

- April 14. SFBAC monthly meeting. Carol Gutierrez, Ascent Logic Corporation. GTE Government Systems in Mountain View at 5:30 p.m.
- May 12. SFBAC monthly meeting, program to be announced. GTE Government Systems in Mountain View at 5:30 p.m.
- June 9. SFBAC monthly meeting. GTE Government Systems in Mountain View at 5:30 p.m.
- July 14. SFBAC monthly meeting. GTE Government Systems in Mountain View at 5:30 p.m.

Validation and Verification Tutorial in San Diego

Jim Peterson, jdpete@pacbell.net

The San Diego Chapter will sponsor a half-day tutorial on "Validation and Verification" to be held on Saturday, June 13, 1998, at the SAIC facility near La Jolla. The lecturer will be Jeffrey O. Grady of JOG Systems Engineering, author of a new book published by CRC Press *Systems Validation and Verification*.

Validation is described as a process for gaining confidence that the requirements identified for a development are achievable and consistent with the resources made available (time, money, and talent). This is therefore part of the risk management activity to be accomplished concurrently with requirements identification.

Verification is described as a process for proving that the product design satisfies its requirements. The two stages of the verification process are woven into the fabric of product development. The first stage of verification planning begins with identification of verification requirements while the product requirements are being developed.

The tutorial traces the planning strings from the product requirements through methods definition to verification requirements, verification task fusion, task planning, task management, and task reporting requirements. The second stage involves implementing the plan and capturing the evidence of compliance, ending in an audit of results relative to the product requirements.

The systems approach begins with defining the problem to be solved and writing specifications. The next step is to solve the problem through sound design, integration, and optimization work. This tutorial completes the process with the proof that the design complies with the problem definition.

For further information about the tutorial, contact Jim Peterson, jdpete@pacbell.net or phone (619) 279-1940.

North Star and Heartland Chapters to Host INCOSE 2000 Symposium

Larry Brezinski, lawrence.j.brezinski@gd-is.com.

Start planning now for the new millennium! The North Star Chapter and the Heartland Chapter are jointly hosting the year 2000 INCOSE International Symposium. The symposium will be held in Minneapolis, Minnesota during the week July 17-20, 2000. The site will be the Hyatt Regency Hotel in downtown Minneapolis, and plans are underway for a full schedule of symposium meetings and other interesting activities. This will be the 10th annual symposium for INCOSE, and we anticipate an exciting kickoff for a new century of Systems Engineering opportunities.

For more information, visit the INCOSE 2000 booth at the Vancouver symposium this summer. If you just can't wait and would like to know more about Minneapolis, a good place to start is www.minneapolis.org.

Colorado Chapter Events

Jim Haney, President, j.h.haney@ieee.org

On January 19, Dr. Peter VanArsdale from the University of Denver presented "Applications of Systems Theory to Systems Engineering" at a chapter meeting in Englewood. This presentation mixed in Dr. VanArsdale's archeological background with his experiences in Northern Africa while performing an international water usage study.

On February 17, Dr. Dai Alex Chuang, Vice President of Strategy and Technology with MarketPower, Inc. in Lakewood (CO), presented "Metrics Convergence: Bridging Systems Engineering Practices and Strategic Planning" at our chapter meeting in Castle Rock. This presentation focused on *applying* a systematic approach to establish and develop a credible Competitive Intelligence (CI) group at the corporate or Strategic Business Unit (SBU) level.

On March 16, Dr. John Reinert, Director with UTMC and President IEEE-USA, will discuss an engineering management topic at a Chapter meeting in Castle Rock.

On March 28, Dr. Mark Maier, University of Alabama at Huntsville, will present a "Systems Architecting" tutorial sponsored by the chapter, and held at Colorado Technical University in Colorado Springs.

On April 20, a chapter meeting will be held with a focus on IPPD and IPT experiences. Feel free to attend our meetings if you are in town on business. For more information, email or phone Jim Haney (719-637-5942).

Midwest Gateway Chapter Consults Members to Set '98 Programs

Don Hess, Secretary, dhess@mdc.com

A recent survey by the Midwest Gateway Chapter revealed some interesting thoughts and desires of the membership. Used as a primary component for planning purposes, the survey results provided input into a 1998 chapter calendar that contains quarterly meetings and semi-annual events/tutorials. The survey proved very useful in deciding what subject matter was important to the membership. As a result, business meetings and programs in 1998 will include systems engineering presentations by local members as well as by out-of-town guests.

Additional feed back included preferred meeting days, times, durations, locations, and costs. By addressing the issues that concern our members, it is hoped that they will see increased value from being an INCOSE member.

Our first event in 1998 will be a tutorial conducted by Ivy Hooks on "Writing Good Requirements." Scheduled for May 9 on the campus of Washington University in St. Louis, it is hoped that this tutorial will be as popular as the Dr. Mark Maier's System Architecting workshop held there last October. Another useful activity, our annual symposium paper review/dry run, will be repeated in June, and will feature Midwest Gateway authors bound for Vancouver. Other events being discussed for the year include possible tours and site visits to companies employing systems engineering concepts.

We would also like to mention that our December '97 appreciation dinner program featured Dr. Terry Bahill of the University of Arizona. Dr. Bahill discussed the need for modeling to support system analysis efforts and shared his experiences of testing his concepts on professional baseball players.

Chesapeake Chapter - A Year in Review

Lance David, Secretary, david@aaicorp.com

The new executive board members took office in January of 1997. Working with the sitting members, the new board endeavored to find ways to improve the participation of members in chapter activities and increase the chapter membership. Many ideas were discussed and several were implemented as described in this article.

In order to help gain recognition for the chapter, a new chapter logo was designed. The logo incorporates the flavor of the Chesapeake Bay. A crane standing on one leg in a bay estuary alongside a stand of reeds ties the logo to the maritime history of the Baltimore area of the Chesapeake Bay. The logo will be added

continued on following page

to the chapter's home page on the INCOSE web site and was also emblazoned on coffee mugs. The logo design and cup have been well received by chapter members, who, along with our guest speakers, have each received one.

As we all know, not every member can make every meeting. To make it easier for members to benefit from the speakers, presentations are videotaped with the speaker's permission. The videotapes are made available to chapter members so that the speaker's message can get the widest possible audience.

Our chapter's working group format has been expanded to include topics of general interest to our membership. One member facilitates a discussion on a technical topic (e.g., integration and test), during which everyone shares experiences, lessons learned, and best practices.

A joint educational meeting was held with the Washington Metro chapter and heavily publicized in order to get the word out on INCOSE and the Chesapeake Chapter. Several local colleges and universities with Systems Engineering curricula were invited to present their course programs and to discuss the various philosophies of Systems Engineering that each school pursues. Feedback from this session was very positive, as indicated by the received comments.

Finally, a chapter picnic was held last fall for all members and guests. An afternoon of sun, games, good food, and socializing provided an opportunity for the members to relax and get to know each other. The work of getting members involved and in expanding the chapter membership is never ending. These first steps have proven successful, though we realize that the process is ongoing.

As we progress into 1998, elections were held for several offices. The new chapter President is Scott Hyer. The chapter has added a new position of Technical Director to the Executive Board, and Charlie Roe and Jim Urbanski have agreed to be co-Technical Directors to oversee the technical activities of the chapter. As part of their duties, they will provide technical summaries on various topics to the board and for publication in the chapter newsletter.

New board members join with the existing members in working to enhance the local community's awareness of the purpose of INCOSE and of the Chesapeake Chapter.

German Chapter Meetings

Herbert Negele, H.Negele@lrt.mw.tu muenchen.de

The following regular meetings are planned for the German Chapter of INCOSE. For more information on these meetings, please email or phone Herbert. We'd greatly enjoy the participation of our INCOSE peers from other parts of the world!

April, 21st:
Topic: "Integrierte Produktentwicklung-Zuliefererereinbindung und Schnittstellenmanagement" (Integrated Product Development-Supplier Integration and Interface Management)
Speaker: A. Gollob, BMW
Time: 6:00 PM

May, 26th:
Topic: "Computer-Aided Project Engineering (CAPE) bei ADtranz - Integriertes, interdisziplinäres Systems Engineering für schienengebundene Transportsysteme" (inkl. Toolpräsentation) (Integrated Interdisciplinary Systems Engineering for Railway Transportation Systems, with tool presentation)
Speaker: Kaiser, ADtranz
Time: 6:00 PM

July, 7th:
Topic: TBD
Speaker: TBD
Time: 6:00 PM

All meetings are held at:
TU München, Fachgebiet Raumfahrttechnik, Boltzmannstr. 15, 85748 Garching (near Munich)
Contact: Herbert Negele, +49-89-289-16008, h.negele@lrt.mw.tu-muenchen.de or have a look at our webpage at incose.lrt.mw.tu-muenchen.de/

European Regional Conference in Noordwijk, The Netherlands

Bill Schoening, william.w.schoening@boeing.com

Eric Honour, Brian McCay and I had the good fortune to represent the central organization of INCOSE at a regional conference sponsored jointly by The Netherlands chapter, the UK chapter, and the European Space Agency (ESA) in Noordwijk, The Netherlands. We went to lend our support for the upcoming INCOSE Symposium in Brighton, England in 1999, to get a sense of the European support for INCOSE, and to learn more about systems engineering. In a nutshell, even our most optimistic expectations were exceeded. We came away confident that there will be a large turnout for the 1999 Symposium, that systems engineering is strong and energetic in Europe, and obtained some new insights about systems engineering.

Conference attendance reached capacity of 260 and walk-ins had to be turned away. Conference organizer, Peter Groepper, with program and technical committees staffed by the three sponsoring organizations, provided attendees with an outstanding array of papers, panels and special events during the three-day conference. The theme, "Systems Engineering — The Future: Learning from each other to do projects faster, better, cheaper," was addressed throughout, and summarized in a panel discussion at the end.

The 44 papers covered a broader range of application contexts than we commonly see at the International Symposium: railway, Channel tunnel, airline security and anti-terrorism, automotive, health care, space, and computer systems. I came away with a deeper understanding of basic SE principles, and strong bond with Systems Engineers in Europe.

Those who attend can anticipate an outstanding professional experience.

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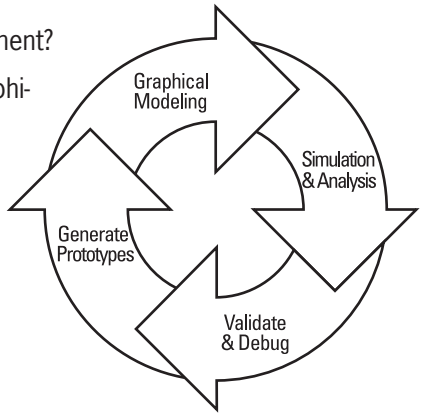

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INCOSE Infrastructure

Membership: The "I" Is 20% of INCOSE

Membership Committee Co-Chairs
Lew Lee, lew@svl.trw.com, and Dona Lee, dnwlee@moon.jic.com

A frequently asked question concerning the growth of INCOSE is, "Why are we *going international?"* The fact is, we have always been international. The U.K. Chapter was chartered in 1994, two short years after NCOSE's incorporation (National Council on Systems Engineering). In 1995, the Systems Engineering Society of Australia (with 180 members) became an INCOSE affiliate. In one sense, when we added the international "I" to NCOSE in 1995, the action was simply a formal recognition of the global nature of our purpose.

So, just how *international* is INCOSE? In the table below, proof of our global nature is represented by the fact that one of every five members resides outside the U.S.

Country	Members
Australia	9 plus 265 Systems Engineering Society of Australian affiliates
Austria	1
Brazil	1
Canada	50
China	3
Finland	3
France	11
Germany	30
India	1
Israel	2
Italy	8
Korea	8
Netherlands	40
Norway	11
Spain	2
Sweden	12
U.K.	140
Yugoslavia	1

333 reside outside of the USA

of 2783 total INCOSE members

Non-USA INCOSE
Total=(333+265)/(2783+265)=19.6%

INCOSE Journal *Systems Engineering*

Andrew P. Sage, Editor in Chief, asage@gmu.edu

Systems Engineering is the new quarterly archival journal of the International Council on Systems Engineering (INCOSE). It is a fully refereed journal and a primary source of multidisciplinary information for the system engineering and management of products and services, and processes of all types. System engineering activities involve the technologies and system management approaches needed for: **definition of systems**, including identification of user requirements and technological specifications; **development of systems**, including conceptual architectures, tradeoff of design concepts, configuration management during system development, integration of new systems with legacy systems, and integrated product and process development; and **deployment of systems,** including operational test and evaluation, maintenance over an extended lifecycle, and reengineering. Modern systems, including both products and services, are often very knowledge intensive, and are found in both the public and private sectors. The journal emphasizes strategic and program management of these, and the information and knowledge base for knowledge principles, knowledge practices, and knowledge perspectives for the engineering of systems. Definitive case studies involving systems engineering practice are especially welcome.

The journal exists to serve the goals of INCOSE. In addition to being a focal point for integration and dissemination of systems engineering knowledge, it will promote collaboration between industry, government, and university relative to systems engineering efforts. It will encourage and assure appropriate professional standards and improve the professional practice of all involved in the practice of systems engineering.

The journal will be published by John Wiley and Sons, New York. Wiley is a leading publisher of textbooks, reference works and journals and has offices located throughout the world. Wiley maintains an active website and, together with the INCOSE website, information concerning the journal should be widely available.

All INCOSE members will receive a personal subscription to the journal as part of their annual membership dues. The first issue of the new journal should be mailed in May 1998, the first of four issues for 1998. There will be approximately 20 associate editors and members of the editorial board, many of whom have been appointed. A call for papers and instructions for authors are available. This is intended to be but one of the many integrated INCOSE membership support efforts. Comments and suggestions concerning the new journal are most welcome.

For more information on submitting a paper to **Systems Engineering**, *see the* ***Call For Papers*** *on page 40.*

SE Center of Competence in the Works

Dennis M. Buede, dbuede@gmu.edu

Brian Mar was the motivating force behind the concept of a center of excellence (COE) in systems engineering (SE), an organization to be chartered by and implemented by INCOSE. The board of directors agreed with this concept in 1997 and provided a small startup budget. The concept was handed off to the Education and Research Technical Committee just as I was becoming chair of this technical committee in the summer of 1997.

Since the 1997 symposium in Los Angeles we have agreed to a charter (with the leadership of Barney Morais), and have enlisted the interest of over 20 academics worldwide in joining such an organization. We have created a notional organizational structure that is being reviewed by INCOSE's Board of Directors, and have created a draft research agenda for the SE COE. The approved charter is as follows:

> The Systems Engineering Center of Excellence (SE COE) provides a broad base of expertise and resources to foster the definition, understanding and practice of systems engineering within industry, academia and government. The SE COE conducts research as needed to aid in the advancement of the practice of systems engineering. The SE COE provides a focal point for researchers from industry, academia, and government to collaborate, share, distribute and extend the existing systems engineering knowledge base. The SECOE acts as the agents for all members to increase awareness of the need for research and to market and increase the level of funding of systems engineering research.
>
> The Center also provides a capability for universities to develop cooperative research efforts for their faculty and students with other universities and utilize resources that may not be available on their own campuses. The SE COE facilitates the exchange of researchers between university, industry and government research institutions to expand and enhance the existing systems engineering research pool.

The current list of academics interested in participating in the SE COE is:

Universities	Country	Key Faculty
AFIT	USA	Kramer
Case Western Reserve University	USA	Chizeck, Malakooti
De Montfort University	UK	Boardman
George Mason University	USA	Buede
George Washington University	USA	Eisner
Iowa State	USA	Gemmill
Loughborough University	UK	Parkin
Mil. Inst. Of Eng. Of Brazil	Brazil	Gondim, Dasilva
New Mexico State Univ.	USA	Gonzales
North Dakota Univ.	USA	Isgrig
Portland State Univ.	USA	Migliore
Rennsalaer Polytech Inst.	USA	Tien
University of Arizona	USA	Bahill
University of Kansas	USA	Holtzman
University of Maryland	USA	Rubloff, Baras
University of Maryland-UC	USA	Kasser
University of Pennsylvania	USA	Anandalingam
University of South Australia	Australia	Sydenham
University of Virginia	USA	Scherer
University of Nevada, Los Vegas	USA	Wells
University of Southern California	USA	Axelband

Equally important as this impressive list of academics, I have received statements of interest from a number of researchers at corporations and government laboratories for participating in the SE COE. Also, a renowned list of retired or retiring academics (e.g., Ben Blanchard, Wolt Fabrycky, and Brian Mar) have pledged strong support and interest in helping move the organization along.

Phil Brown, Eric Honour and I developed the draft structure for the SE COE. We identified the external organizations with which the SE COE would interface, the inputs and outputs to the SE COE, the major functions of the SE COE, and then identified three candidate structures. Our quick evaluation of the pros and cons of the three structures led us to recommend one to which INCOSE had the strongest inputs in terms of guidance, yet provided flexibility for marketing and research activities by a small centralized body of directors and all of the researchers involved in the COE. A key aspect of this structure was the recognition that we were really discussing U.S. activities and that organized efforts of similar scope are underway in both the U.K. and Australia. Peter Brook stopped into our discussion just long enough to make this very clear to us. As a result, we have formulated an SE Network of Excellence (NOE) that the COEs of various countries and regions would plug into. Since this organizational structure is still being reviewed by the Board of Directors and changes are expected, I will not describe it in any more detail other than to say we envision a Board of Directors, Research Advisory Panel and small number of operating executives associated with this COE.

Our draft research agenda is the product of two activities. In October I sent out a questionnaire concerning research issues in systems engineering. Although I only received 13 responses, I did receive a number of very interesting research topics. At the workshop in Dallas, Sarah Sheard suggested and helped organize a

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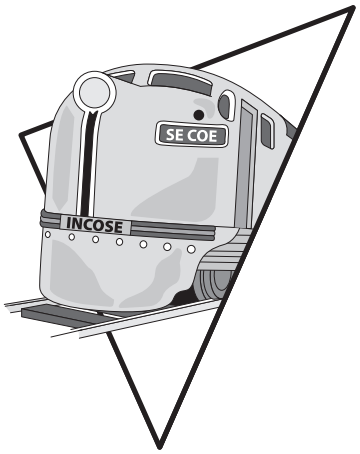
brainstorming session on research topics that generated 45 ideas in an hour. These were then sorted into categories and prioritized as high, medium or low payoff. My thanks to the 11 people who participated in this brainstorming session: Sam Alessi, Phil Brown, Sten Dahlberg, Eric Honour, Dorothy McKinney, Donna Rhodes, John Snoderly, Heinz Stoewer, Jim Van Gaasbeek, Stan Weiss, Bill Wittig.

I have taken these two lists and created a draft research agenda with six major topic areas: Value of Systems Engineering and Elements of SE, Human Productivity in SE Activities, SE Processes and Process Improvement, SE Methods (Design Techniques, Cost Issues, Risk and Trade Techniques), SE Automation, and Formal Methods for SE. *Please contact me to obtain a complete copy of this draft research agenda. Please send me your ideas. I am very interested in vetted comments on this draft research agenda from systems engineering organizations, with additions or modifications as desired.*

The SE COE train is moving. On any given day it seems like movement is at a snail's pace. Yet looking back over the last six months, it is clear that we are gaining momentum and support. We are seeking support and collaboration from industry and government. We expect to have our first research funding this year. If you wish to play a role, please contact me.



Chapters Committee Report

Committee Co-Chairs: Ken Kepchar, gkkep@inlink.com and Sam Rindskopf, m.sam_rindskopf@notes.ymp.gov

The International Workshop in Dallas was a very active time for the chapters' representatives. We shared success stories, issues that concern all of us, and even a few laughs. Directors from each region attended and actively solicited the views of the chapter representatives. Overall, I'd give the experience a thumbs up.

As always, we had a number of new participants because of leadership changes at the chapter level. At the risk of being repetitious, let me cover who we are and what we're about. This committee is established as the forum for presenting the Chapters' perspective at the INCOSE level. The committee meets at symposia and International Workshops. Several communication mechanisms are used to stay in contact between physical meetings, including an e-mail reflector site for the committee members. The committee is headed by me and Sam Rindskopf, both former chapter presidents. Each current chapter president is automatically a member. In addition, regional directors and representatives of "emerging" chapters are invited to participate. Presidents are expected to represent their membership at the meetings, either in person or through a designated representative.

Two years ago, the Membership Committee and the Chapters Committee elected to combine meetings because there was considerable overlap on issues and participation. Consequently, at each meeting we deal with membership issues, ongoing chapter activities, and efforts to increase the outreach of INCOSE within our respective geographic areas.

Highlights of some of the topics discussed include:

- **Organizational involvement at the chapter level** - A committee was formed to explore the question of organizational involvement at the chapter level, with a set of recommendations expected at this year's symposium in Vancouver. The committee representative is Jim Haney (Colorado), who is contacting the chapters for input.
- Chapters members reviewed our efforts to support of this plan. Various chapters accepted the lead role for selected topics. Elements that have not been assigned to a lead chapter will be funneled to Regional Directors. Our goal is that each chapter volunteer for at least one activity.
- **Tutorials & Speakers List** – San Francisco, St. Louis, and Washington Metro discussed their experience in offering tutorials. As a result of this discussion, a preliminary list of tutorials and available speakers was compiled for publication to all chapters.
- **Chapter Startup Kit** – Review of the startup kit contents continues. If you have any comments or questions on this material, please contact Sam via e-mail. (Electronic copies of the startup kit are available from either Sam or myself.) A workshop will be held in Vancouver for members interested in starting a new chapter in their area.

The Chapters Committee is the primary conduit for chapter leadership to share issues, experiences, and ideas at the international level. INCOSE recognizes that chapter members are their primary customers, since the value of INCOSE flows predominately through the chapter infrastructure. However, there were a number of chapters not present at this last meeting. This lack of representation concerns Sam and me because these meetings are outstanding opportunities to have your message(s) directly reach the leadership of INCOSE. Please discuss plans for your chapter's representation at Vancouver with your leadership. If your chapter has a specific topic it wishes to discuss in Vancouver,

please contact Sam or myself so it can be included on the agenda.

Any questions or comments should be directed to Ken (gkkep @inlink.com or 314-234-8156) or Sam Rindskopf (m.sam_rindskopf @notes.ymp.gov or 702-295-3943).

New Committee Chairs

Bill Schoening, President, william.w.schoening@boeing.com

Heinz Stoewer and John Snoderly have been named co-chairs of the Technical Board with Donna Rhodes (Lockheed Martin) as chair. Heinz Stoewer (Professor of Systems Engineering at Delft University of Technology) will help identify and recruit new working group (WG) members and chairs from around the world. John Snoderly (US Defense Systems Management College) has been a WG member, WG chair, and Technical Committee chair for INCOSE. He brings a total understanding of the INCOSE technical community.

Dona Lee (Dynamic Systems) is the new co-chair of the Membership committee with Lew Lee (TRW). Dona has been president of the Washington Metro Area chapter and an active member of the Communications committee. In addition, she has been one of the prime movers for the INCOSE booth at last two symposia.

Ginny Lentz (United Technologies) and Richard Schwadron (Boeing) have taken over as chairs of the Symposium committee following the excellent service of Ron Olson (Zeta) who led this committee through its first two years. As a past president of INCOSE, Ginny brings a strong understanding of the strategic importance of the annual symposium. As chair of the 1995 Symposium committee and negotiator of our symposium management contracts, Richard has hands-on experience with the financial aspects of a symposium.

Sam Rindskopf (TRW) joins the Chapters committee as co-chair with Ken Kepchar (Boeing), following a successful stint as President of the Silver State chapter. Sam has already demonstrated the energy and imagination so important for this job.

Finally, the Communications Committee will be chaired by Randy Case (Raytheon E-Systems), who is also webmaster of the INCOSE website. Randy is replacing Pat Hale (United Technologies/Otis), who was elected to the position of INCOSE Treasurer. Valerie Gundrum (Lockheed Martin) will co-chair the committee with Randy, both these people are longtime members of the Comm2.

As always, we appreciate the support of the companies who sponsor our committee chairs.

Call for INCOSE Fellow Nominations

Elliot Axelband, axelband@mizar.usc.edu

At the January '98 International Workshop, INCOSE's Board of Directors approved a process for the nomination and award of INCOSE Fellows as provided below. Nominators should send their completed nomination packages in one mailing to:

Professor Elliot Axelband
INCOSE Fellow Select Committee Chair
School of Engineering
Olin Hall of Engineering - 200
Los Angeles, CA 90089-1450

Nomination packages received by 6/1/98 will be considered for the first INCOSE Fellow awards. These will be presented at the INCOSE summer conference.

Fellow Award Eligibility. Candidates must be INCOSE members for a minimum of five years. Under exceptional circumstances, this criterion can be waived by the Board of Directors.

Fellow Award Criteria. Fellow awards are based only upon significant verifiable contributions to the art and practice of Systems Engineering, and only upon evidence of same provided in written form to the Fellows Select Committee provided by their nominators.

It is recognized that systems engineers come from different domains — for example, industry, government and educational organizations. They also are engaged in different areas of practice, such as research, application and teaching. In some cases, national security or company policy may inhibit accessibility of supporting materials. Therefore, varied verifiable evidence of contributions to the state of the art and practice are expected to be submitted.

Nominators should identify their candidate's primary strength as that of either a practitioner (applies knowledge), a researcher (develops new knowledge), or a teacher. For a practitioner, the criteria are satisfied by providing evidence about programs that he/she has personally led and/or advanced through the significant application of the systems engineering art. This evidence should be supported by publications, ideally in refereed journals or conferences where possible, or other suitable means. For a researcher, criteria are satisfied by providing evidence about research personally conducted or advanced as a consequence of the researcher's effort. This evidence should be supported by patents, patent applications, books authored, books to which contributions have been made, and publications in refereed journals or conferences. For teachers, evidence is provided through advances made in the state of the art in systems engineering education such as new books, courses, curricula and refereed publications.

Some nominators may wish to submit their candidates for consideration in more than one category. In

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Call for INCOSE Fellow nominations:
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this case evidence must be provided as above for every applicable area.

Fellow Award Process. Each candidate will have a nominator other than him/her self. The nominator will provide a package that consists of the following to The Fellows Select Committee:

1) Candidate Profile
- Name of candidate
- Age
- Primary contribution
- Secondary contributions (if applicable)
- Educational background
- Professional history (employer, years of employment, duties, accomplishments)
- Accomplishments vs. Fellow Criteria

2) Supporting Information

Letters of support, provided by the nominator and at least three others. Ideally all of these should be Fellows of INCOSE (there are none in this first round of the process) or related professional societies, and should state so if this is the case. These letters are limited to two typewritten pages, and should provide:

- Name of nominator/supporter
- Brief educational and professional background of nominator/supporter
- Professional society memberships and position if any in these
- Basis of knowledge about the candidate
- Evaluation of the candidate vs. the criteria, rating of the candidate as an INCOSE Fellow on a scale of 1 (low) to 10 (high)

Those writing letters of support should have the candidate's CV available to them, but all letters of support should be independently written.

INCOSE Officer Nominations

Eric Honour, Past President,
ehonour@harris.com

Each year, the Past President faces the formidable task of finding highly-qualified candidates for INCOSE officers. It's a task that is difficult to accomplish, but also one that is extremely important to us all. The continuity from year to year demands that we seek and find those among us who can best lead INCOSE into our own future.

This year, President Bill Schoening challenged everyone to do a better job of identifying and grooming leaders. In the best of organizations, nominations for any position are no surprise, because the next leaders have been identified and are working in a co-chair position. INCOSE is now applying this step-up leadership, from the Presidency all the way down to working group co-chairs.

Look around you at those who are pulling the load for INCOSE. If you know someone who is leadership material, please e-mail the name to me. Starting immediately, we are seeking candidates for the following positions:

President-Elect (President 2000)

Secretary

Director-at-Large

Region I Director (Industry)

Region II Director (Academic/Govt)

Region III Director (Academic/Govt)

Region IV Director (Academic/Govt)

Region V Director (Academic/Govt)

Region VI Director (Industry)

In Memory of Dick Shaw

Dick Shaw passed away on Thursday, March 5, 1998, after a long illness.

As a member of INCOSE, Dick co-chaired the Modeling and Tools Technical Committee (MTTC). He was also an active member of the North Texas chapter as one of its first members, and was currently serving as a vice-president. Much of Dick's twenty-plus years at Texas Instruments were involved with advancing the state of the practice of systems engineering. In this capacity, he co-authored several systems engineering patents. Dick was also instrumental in TI's systems engineering process, particularly in the development and deployment in TI's premier Integrated Product Development Process.

All of us in the North Texas chapter will miss him.

Mark Sampson
MTTC Chair

Industry News

ISO Project 15288 Update

Jerry Lake, Systems Management international, lakejg@mindspring.com

ISO project 15288 has the mission to define a generic, top level systems engineering framework consisting of the processes needed for acquiring, supplying, developing, operating, and maintaining systems that contain and are dependent on software. This project is being managed by the Life Cycle Management Working Group (WG7) of the Information Technologies Subcommittee (SC7) under a Joint Technical Committee (JTC1) of ISO/IEC. This is the same working group that prepared ISO/IEC Standard 12207, *Software Life Cycle Processes,* August 1995. The working group has been supplemented with system technical experts from various participating countries. Active involvement is contributed by Australia, Brazil, Canada, France, Japan, Korea, Sweden, United Kingdom, and the United States. The individual delegates of WG7 predominately work for software or computer based organizations. Each delegate brings varied national, organization, and individual agendas.

Work on the ISO/IEC 15288 project began in 1995 with JTC1's approval of a requirements document submitted by SC7. As of this date, the delegates have agreed in principle to an architecture of processes put forth during a May 1997 international meeting in Walnut Creek, California. Two working drafts have been prepared. The first, a compilation of proposed process purpose descriptions, scope statements, objectives, and inputs and outputs. This was prepared in Brisbane during a November 1997 international working group meeting. On January 31, 1998, the second draft was published. This draft was prepared by the two WG7 15288 editors using Working Draft 1 (WD1) as a guide. Unfortunately, this second draft varied widely from that put forth in Brisbane so that during the US TAG meeting in Melbourne, Florida, during the week of 9 February, little could be recommended other than to return to the WD1 baseline inputs.

The architecture from which WD1 was drafted in Brisbane was:

Generic Agreement Processes
- Acquisition
- Negotiation
- Supply

Generic Technical Processes
- Stakeholder Requirements Definition
- System Requirements Definition
- Implement Solution
- Transition
- Systems Analysis
- Verification
- Validation

Generic Project Management Processes
- Planning
- Assessment
- Control

Generic Enterprise Processes
- Investment Management
- Miscellaneous Management (project to project)
- Enabling Infrastructure
- Human Resources
- Quality Management

The Life Cycle Process to which the generic processes will be selectively applied to meet life cycle process requirements are:
- Concept
- Development
- Production
- Operations
- Support
- Disposal

It is expected that there will be changes to this architecture.

INCOSE Participates in ISO

Jerry Lake, Systems Management international, lakejg@mindspring.com

INCOSE participates in ISO as a member of an US Technical Advisory Group. INCOSE's representative to ISO is Dr. Jerry Lake, who carries substantial credentials for executing this position. Jerry serves on the US TAG and SC7 for the specific purpose of representing INCOSE in the development of an ISO/IEC 15288 *System Life Cycle Processes* standard. The main purpose of the US TAG is to draft US National Body positions on ISO documents. The SC7 working groups are responsible for writing standards.

US TAG members are responsible to attend all US TAG meetings and to vote on all ballots pertaining to standards and technical reports prepared by the working group in which they are a member, as well as those generated by the other working groups of the ISO subcommittee. The other standards and technical reports for SC7 have to do with software related issues such as assessment, documents, data, integrity, maintenance, and measurement. Ballots are on the US National Body position formed by the US TAG Technical Group that is directly associated with the SC7 Working Group that prepared the document being voted on. Votes by Jerry focus on system-software issues, not the technical content of the software standards or technical reports. Each year, approximately 15 to 30 ballots are conducted and three US TAG meetings and two international meetings are held.

For an effective voice in the preparation of ISO software documents, INCOSE members ought to work through their company or

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agency ISO representative to SC7, or consider active involvement through the US TAG, or for INCOSE non-US members their countrys equivalent group, as a representative of their ISO member company or agency. SC7 documents (committee drafts) are available for member review, but only for standard preparation efforts, not for general information or distribution. Jerry provides Donna Rhodes, the INCOSE Technical Board Chair, with electronic copies of draft documents as they become available. As the chair, Donna is the point of contact for questions on INCOSE membership, representation, and related activities with ISO. Within the Technical Board umbrella, a new technical committee for standards has been approved and is under formation. Interested INCOSE members are encouraged to contact Dr. John Snoderly, acting chair, at his DSMC office. John is also the alternate INCOSE representative to ISO.

Periodically, other short articles will be included in ***INSIGHT*** to provide information on ISO and how ISO standards are generated.

Standards Balloting

Donna Rhodes, Technical Board Chair, donna.rhodes@lmco.com

While INCOSE is not a standards development body, we are active participants in the development, review, and balloting of several standards including EIA-632, EIA-731, and ISO-15288. New efforts are subject to INCOSE Policy TEC-104, Standards.

Under the agreements with the organizations with which we are collaborating, copies of the draft standards under development may not be distributed solely because someone is interested in the content. The individuals receiving copies must be bonafide reviewers or authors.

Standards under development are periodically reviewed, either informally or formally where the result is a ballot vote. Review cycles are restrictively short, for example, 14, 30, or 60 days turnaround. Given the time constraint, the cost constraint of duplicating and mailing copies, and the logistics of consolidating the comments, it is not possible to allow each individual INCOSE member to be involved in reviews.

When a formal review milestone is reached, INCOSE conducts an internal review of the standard, usually responding with a ballot vote to the Standards body, such as EIA. The review board being used for ballot reviews of standards consists of:

- CAB representatives – who are appointed to represent their organization
- Directors – who are elected by the membership (chapters wishing to participate may do so through their Regional Director)
- Technical Board members – who are appointed by the INCOSE President
- Voting members – who participate as the directly-applicable working group, e.g., the Compliance Assessment Working Group (CAWG) for EIA 731.

A Standards Technical Committee is in the process of being formed. Once the TC is formed, a Standards Review Working Group may also be established. Members interested in being a working member of such a group should contact the Technical Board chair or co-chair.

In addition, INCOSE keeps members informed about the progress and content of standards in multiple ways, including: symposium tutorials, newsletter articles, published papers, notes to the admin reflector, and presentations at meetings and symposia. Contact me if you have questions or concerns.

Technical Board Current Status:
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Harwell. The brochure is available on the web page. The Measurement Primer, developed by the Measurement Working Group under leadership of Garry Roedler, has just been approved by the TB and a March release is anticipated.

The Standards Task Force, formed in August, is chaired by John Velman. Rich Widmann is serving as Associate Chair (US) and Heinz Stoewer as the Associate Chair (Europe). A preliminary report was presented in Dallas, and a Vancouver Symposium paper will describe the various types of standards, the importance of each type, and proposes some preliminary roles that INCOSE may take with respect to standards development in the future. Recommendations will be provided to the new Standards Technical Committee.

Volume II of the Vancouver Symposium Proceedings is being developed by the TCs, Interest Groups, and Working Groups. In the past this document has been given to symposium attendees in hardcopy. This year it will be provided via the CD ROM to all symposium attendees and will be posted on the web page to provide availability to all members.

Plans & Procedures. The Technical Community Procedures document is available to the membership via the web page. The Two Year Technical Products and Services Plan is undergoing an update, and this next revision will be posted on the web in late March.

Get Involved! There are many opportunities to get involved in the technical community as a working member, and as a future leader. Feel free to contact any of the leaders of the technical community to discuss how you can get involved, or contact Technical Board Chair Donna Rhodes at donna.rhodes@lmco.com

Third IEEE International Conference on Requirements Engineering

THEME: Putting Requirements Engineering to Practice

An IEEE Software Magazine Technology Transfer Conference
April 6-10, 1998
Colorado Springs, Colorado, USA

Sponsored by IEEE Computer Society - Technical Council on Software Engineering
Corporate Support from Fujitsu and INCOSE

KEYNOTE SPEAKERS

Edward Yourdon, *Requirements Engineering for Y2000 Projects: Why Is It Harder Than It Seems?*
Gerald M. Weinberg, *Experiencing Requirements*

TUTORIALS

Marina Jirotka, *Video Supported Ethnography for Requirements Capture*
Larry Constantine, *Joint Essential Modeling: Collaborative User Requirements Modeling for Usability*
Don Gause, *See Customer Requirements*
Roel Wieringa, *Advanced Structured and Object-Oriented Requirements Specification Methods*

EXHIBITS

PAPERS

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If you have any questions about registration, contact Charlene Svitek:
Phone (412) 833-8944;
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Internet: crs@sei.cmu.edu

Foresight Report on Systems Engineering in the UK

Peter Brook, Director Region 3,
pbrook@dera.gov.uk

During the course of 1997, the UK Chapter of INCOSE featured prominently in an activity that is providing a vision and national strategy for systems engineering in UK, linking industry, academia and government.

The context for the work was the Foresight programme, led by the Government's Chief Scientific Advisor, Sir Robert May. In 1996, this programme published a series of reports (arrived at after intense and widespread consultation) on the state of the national technology base. The range of subjects was very broad, and included leisure, pharmaceuticals, petrochemicals, transportation, information technology and communications, and the defence and aerospace sectors. Each report set out consensus views of all the key stakeholders on research priorities and national goals, with the aim of creating new initiatives, jointly funded where appropriate. An intentional side effect was the forging of stronger links between all parties and the fostering of greater appreciation within the higher education sector of industrial needs for research and education. The UK considers, with some justification, that it possesses a world-class university system, that is insufficiently guided towards national goals.

In early 1996, the Foresight Defence and Aerospace Panel decided to sponsor a number of follow-on studies in specialist areas that it considered of greatest importance, in order to map out more detailed sub-strategies. One of the selected topics was systems engineering, and others included such diverse subjects as high integrity computing, electronic materials and aerodynamics. In each case, a lead institution was also nominated to carry the load of supporting meetings and to undertake publication of the final report. Systems engineering created a problem, since none of the traditional institutions quite knew how to handle it. They knew it was important, but couldn't pin down what it was or who should lead.

So up stepped the UK INCOSE Chapter, and forged a link with the IEE (Institution of Electrical Engineers, UK equivalent of the IEEE) to get the job done. Active UK INCOSE members - Bill Bardo (then President), Allen Fairbairn (current President), Ian Macfarlane (Board Member) and Peter Robson (Brighton 99 Chair) - took prominent roles. Other members - Richard Stevens and Derek Hitchins especially - gave invaluable advice, and I ended up as principal author/editor. Sir Robert publicly launched the report (Ref. 1) at a press conference in July.

In the course of compiling the report, we spoke to and listened to a lot of people. Open consultation sessions were held at two UK INCOSE Chapter meetings, with four further regional workshops co-sponsored with the IEE, both supported by a questionnaire to gather the views of practitioners. In parallel, a survey was conducted which included private interviews with key individual from across the stakeholder community, especially to assess research needs and the perceived state of academic research. The results were published separately in the SERF Report (Ref. 2).

Entitled *Building Integrated Systems,* the first report attempted to convey the nature of the subject to non-specialists — never an easy thing — and illustrated it by giving some project case histories. Space was also given to describing the intellectual and organisational challenges involved in its widespread adoption. Our intention was to make the case conclusively for the importance of systems engineering to the future viability of our national capability in the integrated systems business, both inside and outside the Defence and Aerospace sectors. This was argued as the only credible response to the global

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commercial pressure—across all sectors—for reduced time to market with the right product. We borrowed a phrase from 1997 joint IEEE/INCOSE Journal to sum up the point: *Systems Engineering: The Problem Solving Technique for the Modern Age.*

We discussed technical and procurement trends (such as COTS-based procurement and the advanced use of simulation tools) that will have a bearing on how systems engineering is changing in its application. A section was devoted to analysing the barriers that have stood in the way of the more widespread adoption of systems engineering principles. A picture was also painted of very isolated pockets of academic expertise and a lack of a professional training infrastructure outside a few centres, mostly in the large companies. A most telling point arising from the survey was that only 10% of all the practitioners had any education in the subject—as opposed to training in the use of particular tools —and most of that had been provided by their employers. The academic community, with a few exceptions, was not a major force.

The report made a number of sweeping recommendations in the topics of raising awareness of the subject, working with other institutions (with INCOSE as the key player), using Capability Maturity Models as a way of generating and measuring improvements across our industries, and building a more complete education infrastructure, especially at post-graduate levels (US graduate levels), with integrated Masters courses. It points to the internationalisation of the subject, with the emergence of transnational systems engineering (typified in Europe by a number of projects and agencies—Airbus, ESA, Channel Tunnel and many in the defence field), and the vital importance of agreement on internationally agreed open standards. A clear recommendation was made to support national moves towards the ISO 15288 Standard on Systems Engineering Lifecycle Processes, in which UK plays a prominent role.

Pointing towards MOD, the report called for a close look at the acquisition process, especially where this impedes the development of well-engineered systems, and more funding on defence-specific subjects such as "systems of systems." In the future, we see an *Extended Enterprise for Procurement,* involving all the key players and learning from the business process reengineering community. Addressing research more generally, it proposes the establishment of RISE (Research Initiative on Systems Engineering), funded jointly by all the main parties, including EPSRC (Engineering and Physical Sciences Research Council—equivalent to US NSF), and the building of a Network of Excellence to join researchers in all the main sectors. The point was repeatedly made that the establishment of a definitive, high quality international journal on the subject would be the most important step towards attracting the attention and intellectual commitment of the academic community. The UK is really excited by the establishment of the INCOSE Journal.

Perhaps the most challenging subject, to which we did not really do justice within the time and other constraints, was reaching out from our base in Defence and Aerospace —in which there is still so much to be done as the challenges increase—to the world at large. You will all recognise this as INCOSE's problem in microcosm. Since Foresight is a cyclical and renewable process, we recommended a cross-sectoral study on these wider possibilities on the next pass, and for RISE to take the challenge of addressing generic research needs from the outset.

Summing up is difficult, and probably premature, since the recommendations are still being worked through. However, looking back on the whole exercise, I believe the community can take some satisfaction from what it has so far achieved.

We have made a public statement on the nature and importance of our subject, and in passing placed the name of INCOSE on the lips of key players at the top of the national scientific establishment. Other actions have followed:

- We have started a series of strategies for integration of INCOSE with other key professional bodies such as the IEE and the APM (Association of Project Managers), and are already holding joint meetings.
- We have set a course towards Europeanisation which the November joint conference with ESA enhanced considerably, and Brighton 99 will further progress.
- We held a follow-on conference last fall for senior representatives of MOD, industry and DERA to consider the implications for the defence. Little did we know when we arranged it that the incoming Labour government would choose to conduct a Strategic Defence Review, with acquisition reform (Smart Procurement was the phrase chosen) at its centre. MOD is now openly discussing the fundamental importance of systems engineering. We just caught the right phase.
- Our proposed Network of Excellence, along with RISE, are ideally placed to integrate with the INCOSE Systems Engineering Centre of Excellence (SECOE), which we hope will become a federation of national groupings.
- Our other recommendations are well-timed to merge with the INCOSE Strategic and Technical Operating Plans, which is what we plan to do.

In short, we have made a very useful start on the road towards establishing systems engineering, and INCOSE, on the national agenda. There are many parallels between what we are attempting in UK and the aspirations of INCOSE members in other nations, including the US. We'll continue to keep you posted.

Ref 1. 'Building Integrated Systems', Report of the Foresight Defence & Aerospace Panel, IEE, PO Box 96, Stevenage, Herts, SG1 2SD, England, July 1997. ISBN 0 85296 925 2

Ref 2. J Boardman, C Tully & M Rose, 'Systems Engineering, a Research Framework' , De Montfort University, Leicester, England, Jan 1997 (jboardman@dmu.ac.uk)

The Congressional Fellow Program

Frederick Martin, fmartin@us.net

Since the early 1970s, IEEE and other professional societies have selected and sponsored members for Congressional Fellowships. This year, IEEE selected me and Robert Feuerstein from the University of Colorado for the 1998 program. Most members of Congress don't have the technical background essential to make informed decisions on science and technology issues and legislation that come before them. Congressional Fellows provide that expert technical knowledge.

The Congressional Fellowship program commenced in 1973 created by IEEE, the American Society of Mechanical Engineers, the American Physical Society, the American Chemical Society, and the American Association for the Advancement of Science (AAAS). Highly qualified, accomplished engineers and scientists are selected to work for one year in the offices of individual Members of Congress or as staff members for congressional committees. The Fellows review and modify proposed legislation from an engineering and scientific perspective and function in much the same way as permanent staff members on Capitol Hill.

Congressional Fellows bring to Capitol Hill new insights, fresh ideas, extensive knowledge and education in a variety of disciplines. They can make significant public service contributions and obtain valuable experience in the legislative and political process that governs our nation. Former Fellows have gone on to assume senior positions in the Government and private sector. Most of them agree that the experience had great impact on their professional and personal lives.

It is important to note that the Congressional Fellows are not lobbying or "carrying water" for the sponsoring organization or the AAAS; nor do they generally bring their own agenda to Congress. We are expected to provide non-political, and objective approach to legislation and policy developments.

The program has been a great success and has steadily expanded over the past two decades to include Defense Policy Fellows, Diplomacy Fellows, Executive Branch Fellows, Risk Assessment Fellows, as well as Congressional Fellows.

This year there are 80 Fellows sponsored by 33 organizations and they are distributed as follows:

Congressional Fellows	29
Defense Policy Fellows	2
Diplomacy Fellows	33
Executive Branch Fellows	5
Risk Assessment Fellows	11

The disciplines for the Congressional Fellows break out as: six from psychology, six from biological disciplines, six with medical, dental and pharmaceutical backgrounds, three mechanical engineers, two physicists, two chemists, two geologists, and two electrical engineers. This includes both academic and business disciplines. The Diplomacy Fellows will work for USAID and the Department of State proper, and the Risk Fellows will work at EPA or USDA.

This year, most of the Fellows are early- to mid-career professionals who have come to the program to add another dimension to their careers. A few of us are at, or close, to retirement, seeking opportunities to participate in and contribute to public service programs. After completing their fellowships, many Fellows—perhaps more than 50%—will seek regular employment in the Government to continue their careers in the world of policy and administration; they have caught what is known as "Potomac Fever."

Those seeking a fellowship submit applications to a sponsoring society which then selects one or two of the applicants for the Fellowship program. The sponsoring society generally pays a stipend but the individual must make appropriate arrangements with his/her employer for a leave of absence. The AAAS administers the program, and provides a comprehensive orientation program for the incoming Fellows and guidance on obtaining a position.

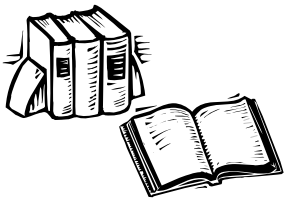
The orientation takes place in the first two weeks of September covering a broad view of how the Federal Government functions. It includes meetings with previous Fellows, visits to agencies, meetings with elected officials, and presentations on topical issues. For example, we had an excellent presentation on world population and a mediocre presentation on global warming. Both presentations were important and informative, particularly the one on global warming in that we were given a view of how a complex issue is reduced to its juvenile elements when it comes to forming public policy.

Most Fellows take up their positions around the first of October and a few of us take up our positions in January. The non-Congressional Fellows generally had prearranged their positions but Congressional Fellows must actively seek a place on the Hill after the orientation program. This implies a full scale job-search, distributing one page resumes and seeking interviews with various offices; one difference of course, the Fellow comes free. Generally one seeks a position with a Congressional Office or Committee that works with issues related to one's expertise. A significant number of offices and committees announce their intention to take on one or more Fellows for the year; they identify the issues that that office will pursue. The congressional office generally has more political activity than the committee office. In the past the House and Senate have employed Fellows in equal numbers.

This year, twelve Fellows are working in a Senate Office, eight are working on a Senate Committee (one committee took three Fellows), seven are working for a House office, one works in a House committee, and one works for a joint Senate-House committee.

I have joined majority staff of the Senate Committee on Energy and Natural Resources. With a background in nuclear physics and IEEE sponsored, I expect to work on legislation regarding energy sources, disposition of radioactive wastes, and perhaps custodial programs and proliferation of weapons grade plutonium and uranium. This committee has not had many AAAS Fellows, the previous was in 1993 on the Democratic staff, I am the first AAAS/IEEE Fellow on the Republican staff.

In addition to this fellowship program, the Brookings Institute administers a fellowship program for congressional fellows coming from government agencies such a DOE, USDA, EPA, and the Army Corps of Engineers. There are other similar programs.

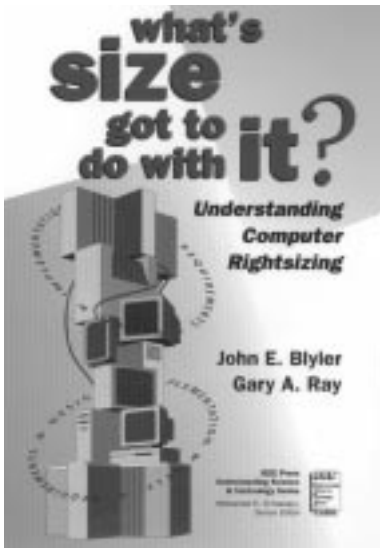


Book Reviews

What's Size Got to do With it? Understanding Computer Rightsizing

by John E. Blyler and Gary A. Ray, IEEE Press, 1998, ISBN 0-7803-1096-9

Reviewed by Joe Simpson, President Elect, Seattle INCOSE Chapter



If you are looking for a comprehensive overview of the "computer rightsizing" arena, this book is for you. The ubiquitous nature of computer systems, coupled with demands for increased efficiency and productivity, presents complex technical and management problems. In this book, Blyler and Ray outline a structured approach to the solution of these problems.

Information and the ability to manage information resources economically is driving many corporate strategic decisions. Whether a company has an existing mainframe computer with dumb terminals, or a set of standalone personnel computers, it must consider how to best embrace the current wave of commercial networking activity.

Drawing on their broad background in technical management and systems engineering, Blyler and Ray first define the "computer rightsizing" challenge and then present a structured systems engineering approach used to meet this challenge. The complete second chapter is devoted to the introduction, definition and exploration of systems engineering as it applies in this area. Their high-level overview is well balanced and covers the complete subject matter, from requirements management to multi-objective decision making. Many references are included to steer the interested reader to sources of more detailed information.

The book's main subject area is illustrated with a set of examples that tie all topics together. These examples are based on two companies: one that has a "down-sizing" problem and one that has an "up-sizing" problem. The subject matter in each chapter is applied to these example companies to illustrate specific management and engineering problem solving techniques. The book ends with a valuable set of appendixes which include an internet resource guide, a rightsizing tools guide, and a glossary of technical terms.

Why Teams Don't Work – What Went Wrong and How to Make it Right

by Harvey Robbins and Michael Finley, Peterson's/Pacesetter Books

Reviewed by John Snoderly, Co-Chair Technical Board, snoderlyj@dsmc.dsm.mil

There are lots of books available about teams these days. Teaming has developed a sort of life of its own with many misperceptions about the effectiveness, size and productivity. The authors of this book provide a realistic depiction of why some of our teams don't seem to be returning all that is expected. It takes more than singing "Kum By Yah" and "Everything is Beautiful" to make teams work together in the complex systems development and acquisition process. I found this book to be a refreshing and insightful approach to what has gone wrong in our teaming efforts. The book is easy to read in a down-to-earth format. Hiring teams of people who are behaviorally compatible is a difficult task. To quote the authors, "Imagine a triple date featuring Isaac Newton and Madonna, George Patton and Oprah Winfrey, Cleopatra and Pee Wee Herman, and you get an idea that there might be few breaks in the conversation."

The book is broken into five parts and 25 short chapters. The five parts are entitled: Broken Dreams, Broken Teams; Why Teams Come Apart; What Keeps Teams from Working; Team Myths; and Turning Teams Around.

I have been using this book as part of my instructional materials for the Defense Systems Management College's "Executive Program Management Course (EPMC)" taught to incoming government and industry program managers at the Colonel 06, Flag 07 and industry PM level. Many of the current challenges that government teams face are discussed, and there are some excellent ideas on how to resolve these challenges.

On the down side, I found the authors attack of the Myers-Briggs approach to be unfounded; it gives the wrong impression of the value of this tool in team forming. The book isn't perfect, but it does contain enough of a refreshing look at reality versus fantasy to earn a place on my bookshelf.

Perhaps this quote from the epilogue says it best: "Teams are surely a fad, judging by the many books and seminars out there competing for mindshare these days. And yet, it is a fateful fad. All the hoopla about it being the wave of the future is true. Individual teams may disband, or remix, or get shuffled into some new entity. But the idea of teams isn't going away, because it's simply not possible — it's simply not affordable — to return to the days of multiple supervisory levels."

The Stuff Americans Are Made Of

by Josh Hammond & James Morrison, Published by Macmillan, ISBN 0-02-860829-1

Reviewed by Ivy Hooks, Compliance Automation, Inc., ivyhooks@tlmworks.com

Having spent the last nine years of my life trying to get people to understand the importance of writing good requirements from the beginning of a program, I was somewhat appalled to hear about this book, "The Stuff Americans Are Made Of." A reference to the book in the business section of the Houston Chronicle listed the seven cultural forces that define Americans, one of which was the *OOPs Factor*. In a nutshell, this states that Americans don't like to do things right the first time — we like to fix things.

I promptly bought the book. I assumed that if this is the way we think then my battle is really uphill, since fighting a cultural problem is much bigger than educating someone. I read the OOPs chapter first, but having read the entire book, I believe there is much in it that relates to the problems faced by System Engineers.

The book covers the seven cultural forces that define Americans, and contrasts our behavior with those of the Germans and the Japanese. It cites examples of those companies and projects that suffer from misuse of the forces. It also provides examples of companies that have learned how to use the forces to increase their productivity. It is basically a fun book to read and gives one a new way of looking at problems. The seven cultural forces are:

1. An insistence on choice
2. The pursuit of impossible dreams
3. Obsession with big and more
4. Impatience with time
5. Acceptance of mistakes (the OOPs factor)
6. The urge to improvise
7. Fixation on what's new

Do I have your attention? Not only do the authors address each force and what it means to those trying to improve productivity, but they relate the combinations of these forces and their effects. They give examples of projects that reflect the problems created by the forces — the Hubble Telescope is covered in the Acceptance of Mistakes. They discuss how very successful companies approach these forces and overcome the associated problems.

Specifically related to our system engineering effort is a discussion in the Impossible Dreams chapter. There is no doubt that Americans can and have had impossible dreams and impossible successes. Why are so many of our dreams unrealized? The authors say it is because we repeatedly fail to communicate our dreams, our visions, our plans to the whole team.

They give an example of Allied Signal and how its president understood this need, and what he did to communicate his dream to his company. There were significant performance improvements — and, hence, bottom line improvements — that have resulted from his approach.

Also in the "Impossible Dream" chapter they discuss a model for dream fulfillment, called LEAP, which stands for:

- **L** Where do you want to land?
- **E** What currently exists?
- **A** What are the necessary actions?
- **P** What processes will be engaged?

This sounds to me a great deal like what we, as system engineers, must do each time we encounter a problem, start a project, or analyze requirements. But this gave me fresh insight into the process and more that could be done.

The discussion of people, in the people, processes, and tools triad, is one that we tend to avoid because it is so difficult. This book, more than anything else I have read, helps explain why that portion of the triad is so difficult and has information to help to cope with that part of the equation.

The New Project Management: Corporate Reengineering & Other Business Realities

by J. Davidson Frame, Jossey-Bass, San Francisco, 1994, ISBN 1-55542-662-X

Visualizing Project Management

By Kevin Forsberg, Ph.D.; Hal Mooz and Howard Cotterman, Foreword by Norman Augustine, John Wiley & Sons, New York, 1996, ISBN 0-471-57779-0

Reviewed by George J. Vlay, 07g21b49@svpal.org

Reviewing these books in tandem provided an interesting contrast between the authors' approaches to the topic of Project Management. *The New Project Management* talks about it while *Visualizing Project Management* provides a step-by-step method of doing it. I recommend that these books be read together to benefit from the additional insights gained by comparing the two. An additional reason to read these books is that each author is providing Certificates of Project Management.

As INCOSE struggles with the concept of certifying systems engineers, I believe that many aspects of project management should also be requirements for systems engineers. One shortfall is that neither author identifies the value of the certificate to contractors in assuring successful performance. Nor is there a timeline of experience required to effectively perform on increasingly complex programs. We should also keep in mind that the removal of a project manager or a systems engineer from an ongoing project becomes success-limiting.

■ The New Project Management

The author's fundamental hypothesis is that the traditional model of project management is inadequate for the current business environment. Mr. Frame argues that the emergence of a new business model is forcing project management to evolve as well. He supports this argument with claims that project managers lack sufficient authority to perform their jobs, and that they must

continued on following page

Project Management: *continued from p 33*

acquire certain non-traditional skills in order to perform effectively. The initial chapter ("The New Business Environment and the Need for a New Project Management") discusses the traits necessary for the new project manager, and how these are escalating as the complexities of today's programs grow exponentially —especially where electronics and software are an integral part of the hardware deliverables.

I question both the hypothesis and the supporting claims. I don't believe that project management is "broken," as the author avers. My personal experience has been project managers are generally given full profit and loss responsibility for their contracts. Furthermore, I believe that the need to acquire non-traditional project management skills has long been acknowledged within industry.

The book addresses a wide range of topics pertinent to program management, as can be seen from the titles of subsequent chapters:

- Managing Complexity: Techniques for Fashioning Order of Chaos
- Engaging Change: Knowing When to Embrace, Accept or Challenge
- Managing Risk: Identifying, Analyzing, and Planning Responses
- Satisfying Customers: Knowing Who They Are, What They Want, and When they Are Right or Wrong
- Acquiring Political Skills and Building Influence
- Building Teams with Borrowed Resources
- Selecting Projects That Will Lead to Success
- Estimating Realistic Costs, Schedules, and Specifications to Ensure Project Success
- Outsourcing to Control Costs, Focus on Core Work, and Expand Resources
- Integrating Cost and Schedule Control to Measure Work Performance
- Evaluating Projects to Maintain Goals, Strengthen Accountability, and Achieve Objectives
- Understanding and Using Performance Metrics: or, Measuring the Right Stuff

I was disappointed to find that Frame's book contains no reference to systems engineering or systems engineering management. Nor was there any mention of the people assigned to support the project manager. The book seems to imply that the project manager does everything unaided. By omitting any discussion of the contribution of system engineers (or any engineers for that matter), the author is unable to adequately describe the functions performed on large and complex programs. This is a significant oversight that weakens the book throughout.

Many chapters of the book would have been improved by the inclusion of some discussion of the role of systems engineering in project management. This lack especially detracts from the chapters on risk management, cost and schedule estimation, customer satisfaction, and handling change. Much of the information presented was rudimentary; this book is definitely not a substitute for a textbook. Cursory treatment is particularly evident in the discussions of cost and schedule estimation and integration.

■ Visualizing Project Management

Unlike *The New Project Management, Visualizing Project Management* provides practical, hands-on guidance that can be directly applied. Early in the book, the authors review various types of project performance models and set the stage for a selected model. The basic 'Vee' model is described and reviewed, highlighting its capabilities to capture the elements necessary to assure project success. The team's "Toolbox of Ten" provides the necessary activities for project implementation. The orthogonal model of project cycle and project leadership provides an excellent visual relationship. A chapter on teamwork covers the latest thinking in structuring and implementing teams with applications to projects.

The book provides a step-by-step method that encompasses budget, business and technical considerations, including systems engineering activities and the risk management requirements. It properly integrates the hardware and software disciplines for a program. A key element is the tailoring of the project cycle for programs that can range from hundreds of thousands to multimillion dollar programs. The application of tailoring is a necessary requirement to both commercial and government programs. Chapter 7, "The Project Management Elements," addresses the heart of the project management process, and integrates the Vee model with the Ten Project Management Elements:

Project Requirements
Project Control
Organization Options
Project Visibility
Project Team
Project Status
Project Planning
Corrective Action
Risk & Opportunities
Project Leadership

The authors close by looking ahead with a review of the trends and forces shaping future management careers. In summary, *Visualizing Project Management* is the book I wish was available when I prepared the Directive on Program Management, Systems Engineering and the Systems Engineering Management Plan for Ford Aerospace–Northern California Operations.

Commentary

Bought Any Good Shelfware Lately?

Lori Pajerek, lori.pajerek@lmco.com

In August I attended the 1997 INCOSE Symposium in Los Angeles. One of my objectives at the symposium was to gain insight into the current state of the art in systems engineering support technology. Nearly fifty vendors sponsored booths in this year's Exhibit Hall, demonstrating tools to support all facets of the systems engineering process, from developing operational scenarios to supporting deployed systems in the field.

As I made my way through the exhibit hall, I had a feeling of sensory overload. The number of tools competing for this market makes it difficult to sort through all the claims of better features, more platforms, superior ease of use, increased productivity, etc. No wonder many organizations have trouble selecting the best tools to support their operations!

As I went from booth to booth, it also struck me that at each one I had to go back to square one in order to evaluate each tool in turn. That is, each tool had a different paradigm: different methodology, different terminology, different icons, different user interface. Each one had to be learned from scratch. Needless to say, this is not an easy task.

Unlike most consumer items, there are no standard sets of expectations for engineering tools. When you buy a car, you expect certain features to be standard, others to be optional. The number of features increases with the class of vehicle you are purchasing, but basically all manufacturers have pretty much the same stuff. And you know in what ways to expect a car to differ from a truck or a motorcycle. You also expect the features to operate pretty much the same way from vehicle to vehicle. If you can drive one car, you expect to be able to drive any car with only minimal orientation to acquaint yourself with the controls (with the possible exception of a standard transmission).

For engineering tools, there are broad categories of standard capabilities that tools are aiming to support, e.g., requirements traceability, baseline management, modeling and simulation. There are even some basic levels of functionality that are becoming standard for these capabilities.

But there are no clear boundaries that separate what can be bought either as an integrated set or an unbundled set of software. Some tools do requirements traceability and system design, but not baseline management; or they do scenario development and system simulation, but not requirements traceability. There are simply no rules or accepted standards about what certain types of engineering tools "should" do. There is also no uniform methodology for implementing the capabilities.

Compounding the confusion is the lack of a standard user interface. One of the attractive features of a tool suite like Microsoft™ Office is that each tool in the set has a similar look and feel. The toolbars all look similar, the same icons are used throughout, the menus work the same way. There is a consistency as the user moves from one tool to the other that creates a comfortable sense of familiarity. It reduces the intimidation factor and the learning curve associated with using a new tool.

In these areas of standardization, engineering tools are five or ten years behind office tools. We have come to expect office tools to live up to the benchmark established by Microsoft. No vendor has yet emerged from the pack as a pacesetter in the engineering tool market. For one thing, few vendors actually sell a whole suite of related tools to perform multiple functions. The usual mode of business is for each vendor to operate within a fairly narrow niche, and to provide Application Programming Interfaces (API) or bridges to other commercial tools to extend functionality. This creates loosely integrated development environments in which each tool looks and feels differently, rather than tightly integrated tool suites in which each tool looks like part of the same family.

All of these factors make it very difficult to assess which tools may meet the needs of your organization. When the wrong decisions are made, the result is shelfware—and a lot of companies have spent a lot of money on software that has turned into shelfware. And it isn't just selecting the wrong tools that can yield this result. You may select the right tool, but use it incorrectly. Either one of these mistakes can cause an engineering organization to deploy a tool in such a way that it becomes an insupportable burden that is eventually abandoned in frustration and disgust.

Myths To Beware Of

Further exacerbating this phenomenon are a number of myths surrounding the adoption and use of automated tools within the engineering development process. This is a relatively young field of endeavor—less than ten years old—and the combination of this lack of experience with a certain amount of wishful thinking has given rise to generalizations that have acquired the ring of truth. Some myths, while often not explicitly articulated, are present in management's thinking when making decisions about tools. Many of these have [mis]led companies or projects down a path from which they found it very costly to return.

- *Myth:* The tool will set you free.
- *Truth:* The tool can improve your productivity; however it can also drag you down if incorrectly deployed.
- *Truth:* Tools need care and feeding; they help engineers, they don't substitute for engineers.

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•*Myth:* The process should drive the tool, not the other way around.
•*Truth:* This is only a partial myth. Process definition exists at multiple levels, and at the higher levels the statement is true. However, at the lowest day-to-day working level, the tool will dictate the implementation of the process to a large degree.
•*Truth*: To some extent, the state of the art drives the state of the practice. Technology advances, methodology catches up. Tools enable you to do things you couldn't do before, therefore they help drive process maturity.

•*Myth:* The mechanics of using the tool can be left to clerical employees; we don't need to tie up engineers with that.
•*Truth:* You will probably have to dedicate at least one engineer to become the expert on each engineering tool you use. It's critical that you have an engineer with detailed knowledge of the tool in order to determine how to apply the tool to solve your engineering problem, and to ensure that the appropriate process is followed. A clerical person can't do that.
•*Truth:* The designers of these tools intended them to be used by engineers. They require cognitive thought and awareness on the part of the people using them. Too often I have seen programs slip into an operational mode where the engineers continue to do the "hard work" on paper, then hand the paper over to a secretary or clerical worker to enter the data into the tool. Then the engineers review hardcopy reports output from the tool, mark them up, and give the changes to the secretary again! This approach largely defeats the purpose of using an automated tool. For any tool to be truly integrated into your engineering process, your engineers must be using the tool themselves.

•*Myth:* A tool should help you do your job; the tool shouldn't be your job.
•*Truth:* This is a variation on the myth above. For most people, the statement should be true. But for some individual(s), the tool is their job. In fact, any given tool will probably be at least two people's job—an administrator and an engineer.

•*Myth:* Buy it and they will come.
•*Truth:* It is human nature to resist change. People don't like leaving their comfort zone, even if efficiency and productivity are suffering by hanging back. You will need a pioneer to champion the use of a new tool. This will probably be the engineer mentioned above. The champion should draw up an adoption plan for inserting the new tool into the workplace. At a minimum the adoption plan should cover:

- The purpose of the tool and its intended application
- The expected benefits
- The expected impacts
- The expected return on investment (ROI)
- Initial definition phase (i.e., training, pilot program(s))

•*Myth:* Productivity gains will be realized immediately.
•*Truth:* Depending on the complexity of the tool, it will probably take many months to realize significant productivity gains. Engineers will go through a learning curve before they become knowledgeable enough to use the tool proficiently. Productivity may even go down for a period during this learning curve. These costs should be accounted for in your ROI calculations.

•*Myth:* Any step that can be automated should be automated.
•*Truth:* You shouldn't invest in tools to automate tasks you rarely do, unless they are extremely labor intensive or the tools are very inexpensive. If a tool is used only rarely, nobody will become proficient in it. It will require a repeated learning curve each time. You probably won't get a reasonable return on your investment.

Closing Thought: 90% of the users will use only 10% of the features.

A version of this commentary appeared in the December 1997 issue of ***CrossTalk****.*

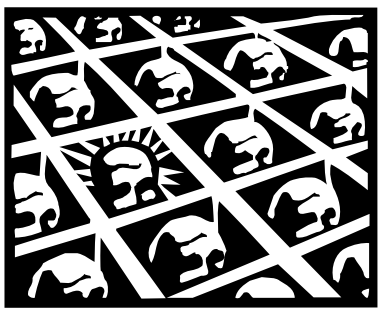
A Benefit of INCOSE

Provided by Ginny Lentz

Members often ask "What do I get for $60 a year." I would like to recall a conversation I had with one member, who was working to develop a Requirements Engineering Guide for a research organization. Let's call him Pete, and here's his take:

> "I got access to a valuable resource of Systems Engineering material that enabled me to efficiently become knowledgeable in the Systems Engineering area. Not only were the INCOSE references helpful in themselves, but through them I was able to become familiar with a cadre of experts in the subject matter. This provided an excellent means by which to research the systems engineering discipline without struggling through radical opinions or methodologies that were heavily influenced by an industry sector. The INCOSE conference enabled me to meet some of these experts and discuss some of my problem areas which were more common than I thought. The result was that I was able to complete the guide I was working on in a relatively short period of time and I have also been better able to serve my customers through the use of a variety of systems engineering methodologies drawn from the experiences of others faced with similar problems."

Worth $60? You bet!



Open Letter to INCOSE Members

WANTED: Your Proven Best Practices

Jim Brill, jbrill@mail.mbay.net

This past summer, I completed a twelve-month assignment in Europe for the Otis Elevator Company. My mission was to assist Otis' European Transcontinental Operations (ETO) to implement a defined Systems Engineering Process. One of the persistent challenges encountered was adequately justifying to Otis' French, German, Italian, and Spanish operations that the investment of resources would yield real results/benefits. This situation is not unique to Otis nor to Europe!

To meet this challenge I started an effort to collect and provide meaningful proven results from implementing the Best Practices associated with Integrated Process and Product Development (IPPD) to include its "technical engine," i.e, systems engineering. My basic approach was to review books, papers, and articles, and search the internet. From these sources, I extracted Best Practices and their related quantitative and/or qualitative proven results. In the time I had for this activity, I identified many worthwhile sources with Best Practices—many from INCOSE, NASA, and authors (several whom are INCOSE members) of books on Concurrent Engineering, Systems Engineering, and Logistics Engineering. Unfortunately, I could not finish the work prior to completing my work for Otis and returning home.

The work I accomplished helped me to convince many in Otis-ETO of the benefits of applying systems engineering within the context of IPPD—especially in the requirements definition process and the use of integrated multi-disciplinary and multi-national teams. After returning from Europe, I continued my efforts to assemble a "Compendium of Best Practices."

To accomplish my work I am using a very simple two part procedure. First, from the references/sources identified, I am documenting an annotated bibliography of one to two pages for each cited reference/source. Second, I am attempting to complete a related document of the Best Practice using the following topical format:

1. Need To Be Satisfied
2. Best Practice Solution
3. Results
4. Principle Source/Reference
5. Tools/Other Sources/References

A brief example of using the above format is as follows:

Topic: Requirements Definition

1. Need To Be Satisfied. Requirements documents need a common structure which should be defined as a company standard and should be checked as part of the document quality assurance process.
2. Best Practice Solution. Define a "Standard Document Structure."
3. Results. Higher quality, lower cost requirements documents.
4. Principle Source / Reference. Sommerville. I., and Sawyer, P., "Requirements Engineering — A Good Practice Guide," John Wiley and Sons Ltd., 1997.
5. Tools/Other Sources/References.

5a. Tools. DOORS, RTM, CORE, RDD-100, CASETS and others.

5b. Other Sources / References.

5b1. IEEE Std 830-1993.

5b2. IEEE Std 1233-1996.

5b3. Dorfman,M., and Thayer, R., Standards, Guidelines, and Examples on System and Software Requirements Engineering, IEEE Press, 1990.

5b4. INCOSE Systems Engineering Process Activities–A "How To" Guide, June 1996 Draft. See section 4.2, Requirements Development.

5b5. INCOSE, "SE Tools by Name" from INCOSE Home Page.

5b6. Andriole, S.J., "Managing Systems Requirements-Methods, Tools, and Cases," McGraw Hill, 1996.

The example above is a short documentation of a Best Practice. Others that I have developed are longer—up to 10 pages including a template or example of the Best Practice Solution, e.g., a SEMP template.

In closing, I want to invite all members, authors and tool developers, to contribute to this work. I am hopeful that I will be able to complete and report on the results within six months. Your contributions will be given credit. Annotated references/sources described in one to two pages are of special interest—particularly from authors on their own work.

The resulting work will be made available to INCOSE either at cost or for free, depending on the form of the final product. At this time I anticipate a published paper rather than a book or manuscript, though a reference product on the INCOSE web site may be possible.

Input is welcome via e-mail, fax, or post. If your schedule permits I would like to receive your input by March 31, 1998.

Best regards,

Jim Brill
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fax: 408-372-2473

Systems Engineering — A First Order Effect

Regina M. Gonzales, regonzal@nmsu.edu

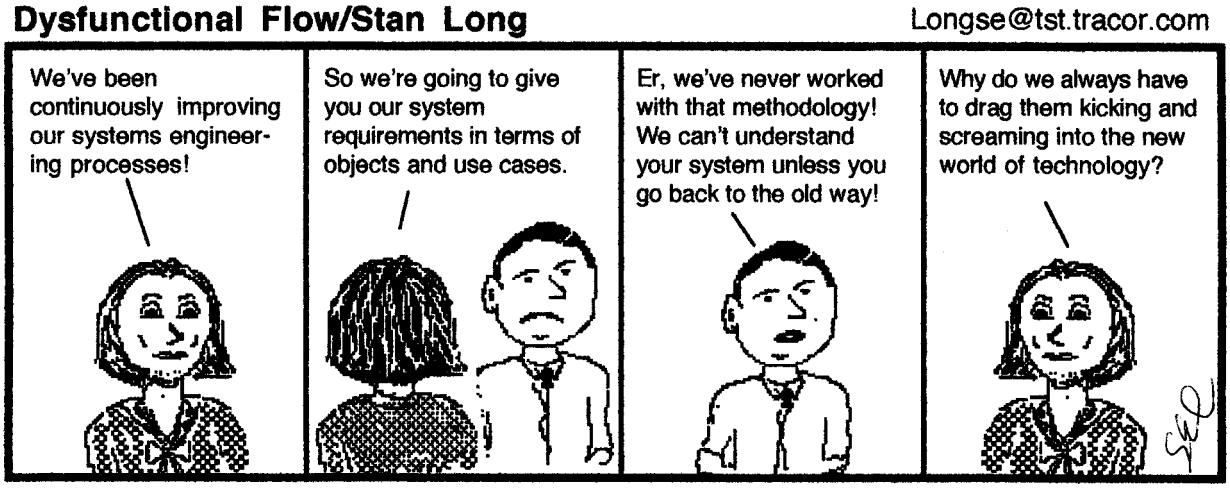
I recently worked for a company that was organized as a matrix organization. I was working in the software group teaching them about requirements elicitation. There was significant frustration with the notion of process within the group. Many of the engineers were trained in Software Engineering and bought into the concepts whole-heartedly, but were frustrated at not being able to get process to take hold within the group. Indeed the manager of this software group was intent on becoming CMM certified at level three (3) minimally. I held a brainstorming session to discuss the concept of 'process'— what it meant to the individuals, what attributes the group had that would make process workable, what obstacles they saw?

The problem boiled down to the fact that these software engineers were farmed out one or two at a time to projects that were managed by "systems engineers." Unfortunately, the systems engineers were not following any defined processes. They demanded "code, code, code." Since the project groups determined, to a degree, the success of the software engineers and, to a larger degree, their job satisfaction, the software engineers were forced to comply.

So the question is, when developing complex computer-based systems, how can the software engineers follow process when the "systems engineers" don't? Systems engineering is a first-order effect for all subsystems. If the "systems engineers" are not writing proper specifications and the requirements never get baselined, how can the software engineers baseline their requirements? In these situations, engineers become unempowered and begin to lose faith in the whole concept of process. The alternative is for them to create a firewall to protect themselves against the whims of the "systems engineers." This degrades the whole concept of integrated product and process development (IPPD).

I am now in the teaching business and I know from my education and from my interaction with colleagues that systems engineering is not being taught to the degree that software engineering is — not to the average graduating engineer. We are beginning to expect that people graduating with a degree in software have taken some minimal course on software processes, which in essence are tailored systems engineering processes. We do not expect the same from other engineering disciplines.

This brings me to a concern I have related to my particular passion, requirements. There is one conference specifically on requirements engineering and a journal published by Springer-Verlag on requirements engineering. Both are lead by the software community. It is very admirable of them, but I believe it reflects badly on the systems engineering community. I believe that good requirements are the foundation of all successful systems and yet we abdicate our responsibility in this crucial area and do not take a leadership role.



Do you have ideas for Stan's next cartoon? Contact him at longse@vitro.com

Systems Engineering:

The Journal of The International Council on Systems Engineering

Call for Papers

The ***Systems Engineering*** journal is intended to be a primary source of multidisciplinary information for the system engineering and management of products and services, and processes of all types. System engineering activities involve the technologies and system management approaches needed for:

- **definition of systems**, including identification of user requirements and technological specifications;
- **development of systems**, including conceptual architectures, tradeoff of design concepts, configuration management during system development, integration of new systems with legacy systems, integrated product and process development; and
- **deployment of systems**, including operational test and evaluation, maintenance over an extended lifecycle, and reengineering.

The ***Systems Engineering*** journal is the archival journal of, and exists to serve the following objectives of, the **International Council on Systems Engineering** (INCOSE).

- To provide a focal point for dissemination of systems engineering knowledge.
- To promote collaboration in systems engineering education and research.
- To encourage and assure establishment of professional standards for integrity in the practice of systems engineering.
- To improve the professional status of all those engaged in the practice of systems engineering.
- To encourage governmental and industrial support for research and educational programs that will improve the systems engineering process and its practice.

The Journal supports these goals by providing a continuing, respected publication of peer-reviewed results from research and development in the area of systems engineering. Systems engineering is defined broadly in this context as an interdisciplinary approach and means to enable the realization of successful systems that are of high quality, cost-effective, and trustworthy in meeting customer requirements.

The ***Systems Engineering*** journal is dedicated to all aspects of the engineering of systems: technical, management, economic, and social. It focuses on the life cycle processes needed to create trustworthy and high quality systems. It will also emphasize the systems management efforts needed to define, develop, and deploy trustworthy and high quality processes for the production of systems. Within this, ***Systems Engineering*** is especially concerned with evaluation of the efficiency and effectiveness of systems management, technical direction, and integration of systems. ***Systems Engineering*** is also very concerned with the engineering of systems that support sustainable development. Modern systems, including both products and services, are often very knowledge intensive, and are found in both the public and private sectors. The Journal emphasizes strategic and program management of these, and the information and knowledge base for knowledge principles, knowledge practices, and knowledge perspectives for the engineering of systems. Definitive case studies involving systems engineering practice are especially welcome.

The Journal is a primary source of information for the systems engineering of products and services that are generally large in scale, scope, and complexity. ***Systems Engineering*** will be especially concerned with process or product line related efforts needed to produce products that are trustworthy and of high quality, and which are cost effective in meeting user needs. A major component of this is system cost and operational effectiveness determination, and the development of processes that assure products that are cost effective. This requires the integration of a number of engineering disciplines necessary for the definition, development, and deployment of complex systems. It also requires attention to the lifecycle process used to produce systems, and the integration of systems, including legacy systems, at various architectural levels. In addition, appropriate systems management of information and knowledge across technologies, organizations, and environments is also needed to insure a sustainable world.

The Journal will accept and review submissions in English from any author, in any global locality, whether or not the author is an INCOSE member. A body of international peers will review all submissions, with potential author revisions as recommended by reviewers, with the intent to achieve published papers that:

- Relate to the field of systems engineering
- Represent new, previously unpublished work
- Advance the state of knowledge of the field
- Conform to a high standard of scholarly presentation

Editorial selection of works for publication will be made based on content, without regard to the stature of the authors. Selections will include a wide variety of international works, recognizing and supporting the essential breadth and universality of the field. Final selection of papers for publication, and the form of publication, shall rest with the Editor.

The journal will begin quarterly publication at the beginning of the second quarter of 1998 and four issues are anticipated in 1998. Submission of quality papers for review is strongly encouraged. The review process is estimated to take three to five months. Five copies of your manuscript should be submitted for review purposes to:

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SESA Conference ad
full page

INTERNATIONAL COUNCIL ON SYSTEMS ENGINEERING UK CHAPTER

INCOSE UK FOURTH ANNUAL SYMPOSIUM

JUNE 1– 3, 1998

Professionals in all disciplines are continually faced with making choices. Making the right ones will determine the success or otherwise of almost any programme or product. However, straightforward comparisons between clear cut alternatives are rarely possible and complexity soon becomes a dominant factor. What is the "right" choice to make and how do we go about defining it? How can we assess and mitigate the risk factors involved when exercising choice? These and other topics will form the theme of our fourth annual symposium:

Systems Engineering – *a matter of choice*

The discipline of Systems Engineering has developed successful techniques for making the right choices even where the options and variables seem too complex to handle. It teaches you to focus on key issues without losing sight of the whole picture and it promotes and sustains the vital relationships needed with other disciplines to formulate the broad, holistic context within which the right choices are to be made.

Building on the lessons of our previous, successful symposia and, particularly, in response to valuable delegate feedback, we will be exploring this theme in the following ways:

- **Invited & Refereed Papers** will investigate and develop the key issues;

- **Case Studies** will be presented in a full, half-day session providing relevant illustrations from real life experience;

- **Systems Engineering & Project Management:** key choices made by one of these disciplines without involving the other are fundamentally flawed, yet just how do we work successfully together, reconciling the various conflicting interests, to provide quality, within time and cost budgets? A further half-day session run jointly with the association of project managers will address the issues involved with a broadly based systems approach.

- **Tutorials**, run by professionals in their field, will provide a choice of more focused information and training in subjects directly related to the business of making choices. Half-day and one day sessions will be provided.

- **Exhibitions:** latest developments from established exhibitors will be displayed, as well as presentations from a wider circle of skills and expertise, following interest generated through our own and through jointly sponsored events in 1997.

- **Venue:** We have managed to secure the unique facilities of The RAF Museum at Hendon for the Symposium, exhibition, tutorial sessions and symposium dinner. Facilities include a tiered lecture theatre for 200 delegates and a spacious exhibition hall nearby. It is planned to have a reception and the symposium dinner in the Battle of Britain hall.

Prices for the symposium will be £250 for members with the option of attending half or full day tutorials at a further cost of £90 or £145 respectively. Reduced prices for attendance on one symposium day, for the exhibition and/or tutorials only will also be available. Prices for non-members will include a £40 surcharge, which will provide membership for one year.

Accommodation: Details of local hotels offering a range of accommodation facilities will be provided with the registration form.

Registration and full programme details will be sent out in mid February. If you require further information in the meantime, or if you are not on our regular mailing list, please contact:

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20 Beehive Lane, Binfield, Berks. RG12 8TU
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What's Inside

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